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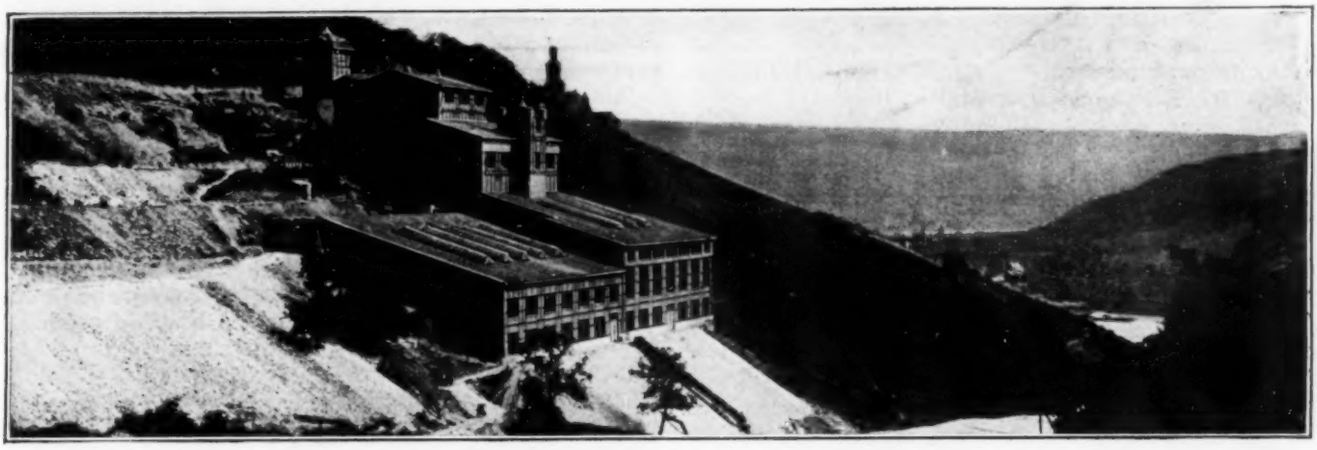


FIG. 1—WET MECHANICAL AND ELECTROMAGNETIC CONCENTRATION PLANT (HUMBOLDT) AT ROSENBERG MINE NEAR COBLENZ FOR LEAD SULPHIDE ZINC AND CARBONATE OF IRON. CAPACITY 165 TONS IN 10 HOURS

German Competition—The World's "Bogey Man"

By HENRY OBERMEYER and ARTHUR L. GREENE

Germany's threat of renewed industrial supremacy—The actual conditions—Ever increasing pay for machinists—One factory issuing own currency—Russia, Germany's logical field of export

GERMAN Competition—that, in a phrase, is the name of the international "bogey man" who is frightening the machine manufacturers of the supposedly victorious countries of the world today. Whether he has a real existence or whether he is merely a figment of a disordered imagination conjured up out of an ever mysterious Germany is a question that most manufacturers of machines in the Allied countries and in America are trying to answer for themselves.

The writers have spoken with managers and directors of some of the largest machine factories in England, France, Belgium and Holland, and, almost without exception, have listened to expressions ranging from doubt to actual fear of Germany's potential power. This article is, in part, an attempt to describe and analyze the foundations of this fear from the viewpoint of the German manufacturer himself.

Is Germany an Industrial Factor?

Because of it the industrial world has been in a small panic for the last three years and a half, believing that the Germany which had lost the war was preparing to win the peace, and apparently succeeding. As a result we see everywhere hastily erected tariff barriers in the form of a half effective embargo against German goods. Have these drastic measures any real justification in facts? Has the mythical Nietszian superman again brought the world to credulity? Let Germany answer for herself.

The machine manufacturing center of Germany lies in the region between Essen and Cologne, this industry alone employing, according to recent figures, approximately 1,500,000 men. Here, with the exception of the electric motor industry, are the principal factories of most of Germany's big makers of machines. It was here that the writers went for information, interviewing the directors of these companies so far as possible, and getting the views of bankers, business men and others in close touch with the situation. Especially helpful was a director of one of the largest machine factories in the district, who spoke with disarming frankness of the situation, but at the price of remaining unquoted and incognito.

The final result divides into two phases: first, that Germany, temporarily at least, is a broken, sawdust figure at the end of her resources; secondly, that she is, at the same time, working day and night to make her threat of renewed industrial supremacy a reality. What

we have to deal with here are the unprecedented, almost unsolvable problems with which the German machine manufacturer is trying to grapple on the one hand, and the possible, eventual triumph of traditional German efficiency on the other.

The Important Humboldt Factories

One of the most interesting and one of the largest of the German machine factories in the Cologne district is the Maschinenbau-Anstalt "Humboldt," nearly seventy years in existence, employing a working force of approximately 5,000 men, and making, on a large scale, mining machinery of all kinds, turbines, steam engines and locomotives, ice making and brewing machines, cranes and loading appliances, pneumatic equipment, structural iron and bridgework, perforated sheeting, and many other iron and steel products. This company is important for our purpose because it is one of the leaders in what may well be called the key industry of the moment in Germany-mining.

Despite its many years of existence, Humboldt plays, in some respects, the rôle of a new factory. Before the war it dealt in nearly all its specialties impartially, reaching in 1913-14 a production of 65,000 tons for the year representing an annual capital turnover of 29,000,000 gold marks. With the war, Humboldt turned every square inch of its shops into the manufacture of munitions and war equipment, being one of the few factories in Germany which converted itself completely without continuing a single item of its former products.

This policy, which it afterward regretted, left the company at the end of the conflict under the necessity of restoring itself just as completely as some of the factories in the devastated regions of France and Belgium, not, of course, because of destruction, but because it had on hand an entire plant full of machinery, most of it utterly useless for the pursuits of peace. With its reorganization, the company has devoted itself chiefly to the manufacture of mining machinery and machinery allied to the extraction, separation and dressing of ore. The significance of this may be seen as we continue.

Whatever foundation there is for the fear of German competition today lies in the fact that Germany can obtain hand labor at prices lower than any of her competitors. For this reason she is able, to a large extent, to counterbalance the effect of the ruinous prices she must pay, both in and out of the country, for raw materials, especially coal, iron and copper.

Germany's Cheap Machinery

It is a fact, known the world over, and readily admitted by the German manufacturer, that for three years—as late as up to last spring—Germany was flooding the international market with cheap machinery made by cheap labor. She hoped and worked desperately to the end that the volume of her exports would help to stabilize the mark before other elements, now seen to be inevitable, entered in to drag it further down. The important thing, however, is that German competition with foreign manufacturers has been steadily decreasing for the past ten months, and that at this writing it has virtually disappeared as a menace. So, at least, the German manufacturer asserts, and there is excellent evidence to support his assertion.

Certainly it is a fact, known to every importer, that prices for German goods have been steadily rising during this interval. The direct causes for this are, basically, the constant and as yet unchecked fall of the mark, but, principally, the fact that low wages in German machine factories not only no longer exist, but even threaten to make large scale production an impossibility in the near future. Because of these things, and because of the tariff walls in France, Spain, the United States and other countries, as one German business man expressed it:

"Germany today has passed the period where she can export goods cheaper than any other country in the world. She is now on a par with other nations and from now on can compete successfully only on the ground of quality."

In October, when this statement was made, the average workman in a machine factory was making about 30,000 marks a month. The month before he was receiving 20,000. At this writing, he is receiving approximately 50,000 marks. Obviously a condition of this kind cannot be continued indefinitely. The end, whatever it is, is measurably near. Let those who still fear German competition consider some of the following problems, directly concerning the machine industry.

Employment Problems

Of first and immediate concern is the labor problem. "Humboldt," for example, we have already said, employs 5,000 men. That is approximately the same number as were employed before the war. There are enough orders now to keep the factory running at normal capacity; but these orders are nearing completion, and it seems likely that there will soon be a slackening of activity. Will there also be a corresponding decrease in the personnel? It is not probable.

The amazing, but admitted, fact is that German manufacturers are afrraid to discharge men for any reason whatsoever. The precipitation of an unemployment problem on top of all Germany's other difficulties would, it is said, cause another revolution in less than a month.

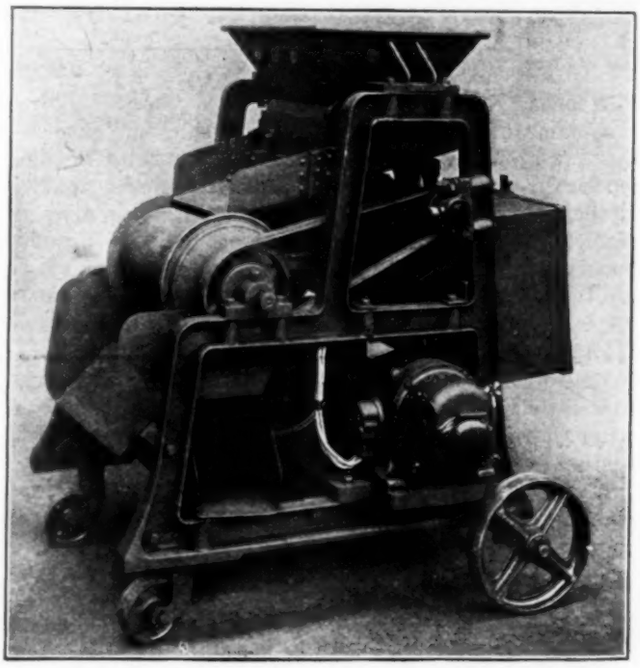


FIG. 2—MOVABLE IRON SEPARATOR FOR RECOVERY OF IRON FROM WASTE OF FOUNDRIES AND WORKSHOPS AND THE SEPARATING IRON AND METAL CHIPS

For precisely the same reason manufacturers are afraid to make substantial decreases in wages, although their continual pyramiding in a vain attempt to keep up with the climb in the cost of living will sooner or later imperil the very industries themselves.

"The only way to make the men realize the necessity of lowering wages," said one of our informants, "is to prove to them by the falling off of new orders that we can no longer continue in business. By that time it will be too late to be of benefit."

As a matter of fact, on humanitarian grounds alone, any considerable lowering of wages is out of the question. Much of Germany's food comes from abroad and the cost rises in direct proportion to the fall of the mark. Most important of all, this year's potato crop—otherwise of bumper proportions—has rotted almost fifty per cent owing to an extraordinarily rainy season.

It is a "vicious circle" waiting for an explosion of

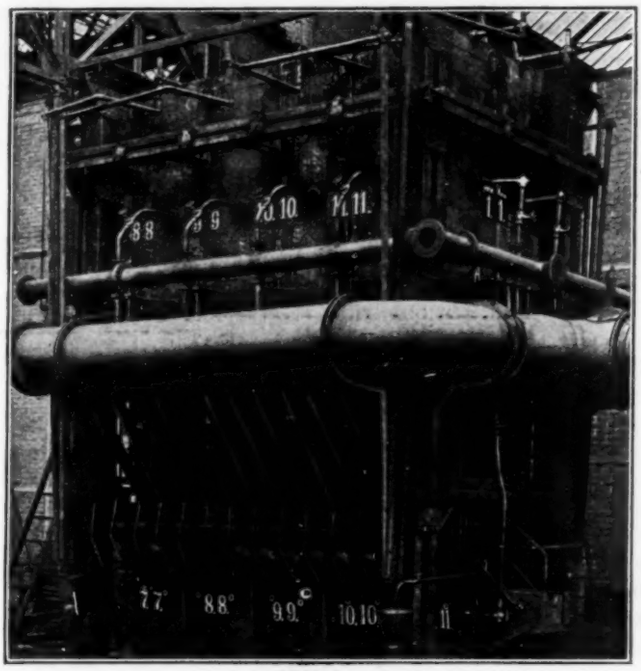


FIG. 3—WATER JACKET FURNACE FOR COPPER ORES. CAPACITY 30 TONS

some kind to break through the circumference. It is far worse, far more inflammable, because of the fact that the compact, orderly and well led unions which existed in Germany before the war are today in a chaotic, almost anarchistic state, with few leaders worth the name and no disposition on the part of the workers to follow.

The employers, on their part, are given little if any help by the Government in the matter. They are hemmed in by Government restrictions of employment and wages, and yet do not even receive enough paper money from the Government printing presses to pay their men. They must pay according to a scale of "classes" in the various industries as fixed by the State. As a result of such Government paternalism, the worker with a family to support gets but little more than a single man in many cases; and while the bars and beer gardens are filled with young men with sufficient money and no responsibility, the married man is scarcely able to buy life's necessities.

Moreover, it does not add to the general sense of

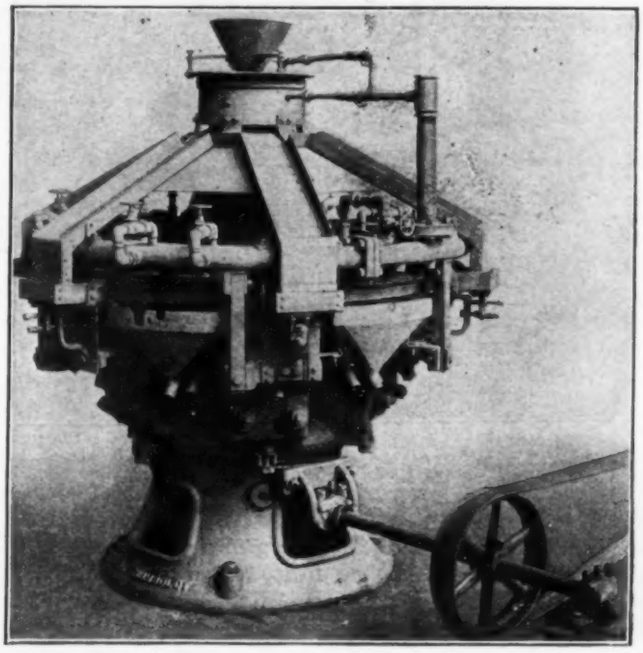


FIG. 4—ELECTRIC MAGNETIC RING SEPARATOR FOR SEPARATING HEAVY MAGNETIC MATERIAL SUCH AS CARBONATE OF IRON FROM ZINC BLEND

harmony when the men, as often happens when the Government printing presses are behind their schedule, are compelled to wait as long as three or four days for their money. One large factory in Aachen (Aix la Chapelle), the Hüttengesellschaft der Rothen Erden, formerly German-owned, but now in the hands of French capital, has attempted to solve the problem by issuing its own currency in series of 500 and 1,000 mark notes. The first notice to that effect was posted on Sept. 14 with a special appeal to tradesmen of the district to accept this emergency paper in lieu of Government notes. One may even suppose that the local merchants are not entirely averse to the innovation, for there is more confidence in a visible, going concern like a factory, than in a shifting, ephemeral concept like the present German State.

Cheap Labor Is Weak Competition

These are some of the reasons why the German army of cheap labor is not quite the compact, irrresistible force the world has been led to believe. It is extremely significant, however, that while the labor problem is apparently passing beyond hope of immediate solution, Germany's other great problem, that of raw materials, is gradually yielding under pressure from the country's efficient engineers.

The question of raw materials, as is well known, has been a serious one for Germany ever since she was deprived of her colonies and her valuable coal and iron fields in Alsace-Lorraine and Silesia. Recently, with the latest substantial drop in the mark, it has become intolerable. Everything in the long run, of course, comes back to the mark's instability. Not merely, be it noticed, to its low value. What Germany needs today more than anything else is some standard of values, whether low or high, which will remain somewhere near the same level for the course of a single twelve months.

Under present conditions it is impossible to make any kind of plan for the future. A manufacturer buys iron ore for 3,000 marks, let us say, puts it into a machine,

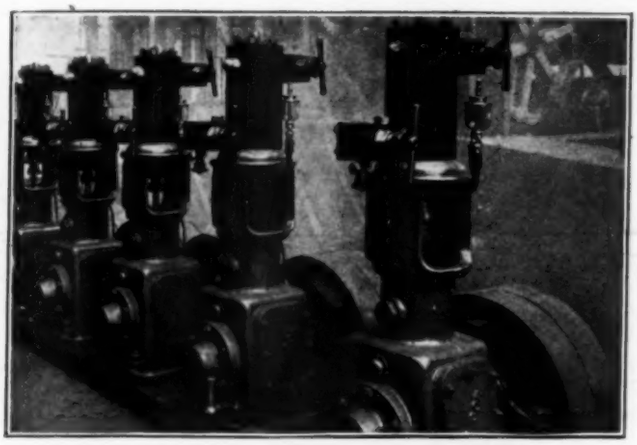


FIG. 5—QUANTITY PRODUCTION OF VERTICAL FREEZING MACHINES

and sells it—perhaps—for 4,000, making a net profit of 1,000 marks. The next time he comes to buy the raw product, he finds it has gone up 1,000 marks or more and has eaten up his profits. On his next turnover, he increases his price by another 1,000 marks, but the raw material also continues to rise. He can follow the rise, of course, by increasing his prices, but the result is an ever increasing restriction of capital, from which follows inevitably a proportionate restriction of output. If such a thing as a constant standard of values were possible, much of this confusion could be avoided. Meanwhile the German "bogey man" is tied to still another stake.

The Problem of Raw Material

What, then, is the obvious remedy from the German point of view? Increased domestic production of raw materials, of course. Is this possible in spite of the loss of Alsace-Lorraine and Silesia? German manufacturers say it is. At any rate, they are trying to make it so. They seem to have reconciled themselves, so far as possible, to the permanent loss of Alsace-Lorraine. Silesia has been more difficult for them to abandon.

German manufacturers content themselves with saying that Alsace-Lorraine has suffered by its separation from the Fatherland in greater proportion than Germany. France, they say, never did much exporting of iron and steel products in any case, and is doing almost nothing now, which is true. Germany, on the other hand, has great need for the coal and iron deposits in its former provinces, but cannot obtain them because of the disparity in exchange. As a result, Alsace-Lorraine has lost the most obvious market for its output. Meanwhile, Germany buys much of its coal from England and the price of German coal rises nearly to the world level. The rise in German coal prices, which is continuous, is well illustrated by the following table showing the increase for only two weeks and a half:

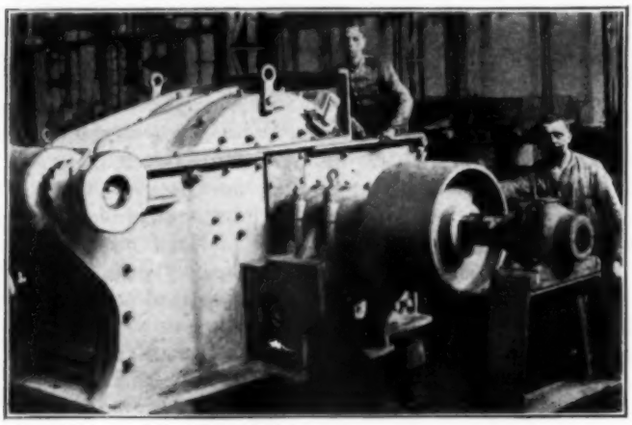


FIG. 6—THE HUMBOLDT CRUSHING MACHINE

Quality	Price, Sept. 11 Per 1,000 kilos, English Pounds Marks	Price, Oct. 1 or 2,204.6 Marks
Haematite	29,722	30,544
Foundry Iron I	26,242	27,413
Foundry Iron III	26,172	27,343
Foundry Iron (Luxemburg)	24,267	25,933
Siegerland Steel Iron	28,713	29,763
Spiegeleisen (8-10% Manganese)	31,433	32,483
Copperless Steel Iron	29,045	29,876

With more recent declines of the mark, the rise in prices has been even more precipitate. Here in this table and in the observations preceding it, lie the reasons why factories like Humboldt are devoting so much of their time to the manufacture and development of mining and allied machinery. By making up for her lost deposits through efficiency and through the development of hitherto neglected sources of power and ore, Germany can do much to counterbalance the labor problem and to restore herself to something of her pre-war self sufficiency. As an example:

Deserted Foundries Are Common Sights

From Bonn, which is at the southern end of the Cologne bridgehead, starts the Sieg River, a tributary of the Rhine, flowing in a general easterly direction as far as Siegen. Along this river, from Siegbourg to Siegen and including the towns of Eitorf, Wissen and Kirchen, extends a field rich in iron and coal deposits. Traveling this way one can see foundry after foundry, most of them virtually out of use for more than fifty years, breaking forth into sudden, new activity. This field was for a long time unexploited because it could not compete with the richer fields of Alsace-Lorraine. Now necessity has given it a new impetus.

This is only one source of supply heretofore largely unrealized and now rising to meet the needs of the German machine industry. By new methods of separation and by painstaking work over otherwise unutilized sweepings from the mines, German engineers are laboring to increase the country's production of iron and coal. In the matter of raw materials, Germany realizes that her only salvation for the next few years is to make herself as independent as possible of her competitors.

The work done by the machine factories in this direction is especially interesting. Humboldt, which specializes in turning out large dressing and crushing plants under scientific conditions, has established one of the largest and most complete laboratories of its kind in the world. It was originally built in 1912, but has latterly developed to a position of importance never realized before. The tests there made are for the purpose of handling ores under actual working conditions to the end that no labor or material may be wasted in the operation of Humboldt machinery as finally used. By careful tests of raw materials the laboratory experts advise their clients as to the proper methods of dressing and crushing ores and even undertake to say whether such ores are worth working at all, and if so to what extent.

No expense has been spared in fitting the laboratory with the best of machines and apparatus required for

crushing, wet mechanical, electro-magnetic, and electrostatic dressing, for briquetting, metallurgical and other tests, all of which are carried out under conditions exactly similar in all phases to those of actual use. A chemical laboratory in connection with the testing station goes into the mature of the products during the tests or after so that the factory and its customers are always informed without loss of time as to the result of the particular processes adopted.

Raw Material Tests

Materials for the tests, of course, are furnished by the customers themselves, who are urged to present samples showing exactly the character of the deposit to be tested and the material with which it is bound up together with particulars as to moisture, contents of clay or other foreign substances undergoing change during transport, particularly in the case of coal. For decisive tests five to ten tons of raw ore are required; for washing tests of coal ten tons of screened small nut coal below 70 to 80 mm. size of piece are necessary. In

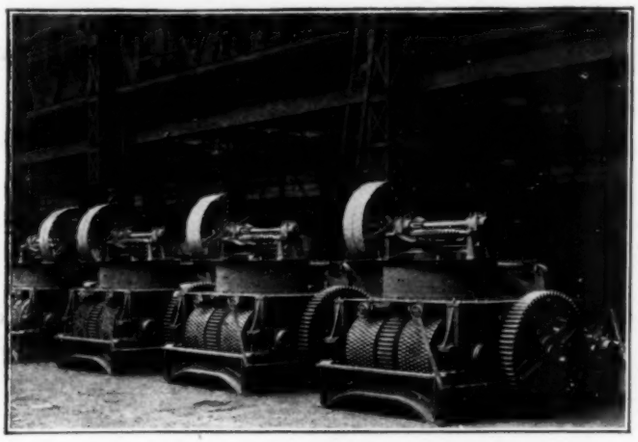


FIG. 7—SERIES OF EGG SHAPED BRIQUET PRESSES ON MOUNTINGS. A HUMBOLDT MINING SPECIALTY

guaranteeing its machinery or proposed plant, Humboldt requires the raw materials to be of exactly the same quality as the samples sent for test; the dressing plant to be built exactly according to the company's plans; the mechanical equipment supplied, fitted up and started by the factory, and the method of treatment proposed by the manufacturers to be strictly adhered to in the work. Smelting tests, roasting and lixiviation tests are also carried out in the company's laboratory. The advantages of this system are thus summed up in the company's prospectus:

Accuracy in Tests

"By the aid of the weight analyses and tests by the dry method, each stage of a test can be accurately determined and checked. The figures thus obtained afford a guarantee for the successful treatment of any ore. Where tests of coal are in question, accurarte determination of ash in the laboratory will bring the washing tests to a satisfactory result within the briefest time. The testing of materials in other forms, as, for instance, amalgamation tests, are checked under the most favorable conditions by the aid of the laboratory, so that the method of extraction can be decided in a practical way on the basis of accurate figures. In the case of lixiviation tests with ores, for extracting the metal in watery form, the laboratory is also an important auxiliary for carrying out the preliminary tests and determining the percentage which can be extracted from the material."

In this case, it will be appreciated, Humboldt is helping itself as well as the machinery industry in general by specializing on those machines which go toward the extraction and preparation of the necessary coal and ores. Interest in mining, therefore, is temporarily, crowding out the interest in developing the German export trade. For the moment, large scale exporting is at an end, but plans are already being considered in the event of a partial German restoration.

Machine manufacturers naturally turn their eyes toward Russia and the East. Humboldt and other factories are sending locomotives to Russia. Russia, indeed, is the logical field for Germany at the moment, partly because the rate of exchange is favorable to Germany, and partly because Russia, which is sadly in need of manufactured goods, is hampered in securing them elsewhere. Russia has raw materials. Germany has factories. In the light of these facts trade agreements between Russia and Germany are believed to be under way, but German manufacturers assert that they will take one or two years to materialize.

International Trade Hopes

The German machine manufacturer places great hope on co-operative organizations such as the Stinnes group both in and out of Germany reaching reciprocal international trade agreements among themselves without concerning themselves with wholly extraneous political considerations. At present, for example, German exports to France consist chiefly of payment of reparations in kind. It is expected before long, however, that some kind of an international clearing house will be established for the exchange of manufactured goods and raw materials. German machine manufacturers make only one suggestion and demand, namely, that such a clearing house or organization be run solely by business men, not politicians or "statesmen."

German machine manufacturers, incidentally, report many inquiries from China and Asia Minor, but, with traditional Oriental cautiousness, it is expected that orders from these parts will not be received for at least twelve months.

What the Future Holds

In closing, it must be added that no apparent activity, no hope for the future, seems able to lift the cloud of depression and unrelieved pessimism which many machine manufacturers in Germany seem to have wrapped around themselves.

"Germany is rushing toward a precipice," said one manufacturer.

"Germany faces another revolution within a year," said another, asserting that "the Government should long ago have thrown up its hands and challenged the Allies to come in and run the country to suit themselves."

Some of this talk is for effect. Much of it, however, is merely a sad realization that the "bogey man" of German competition in the world machine market is, if not dead, at least "seriously indisposed." It remains for Germany to accomplish the work of resuscitation, which up to the present writing they have been totally unable to accomplish.

Opportunities For Saving Material and Labor

By S. N. Bacon

Material and labor can often be saved in the punch press department by using improved tools. In many instances, where punches and dies for blanking, drawing, and other operations, are duplicated for the purpose of increasing production and additional operatives are employed, the expense could have been saved or greatly cut down by redesigning the tools.

Properly designed progressive dies make it practical to combine drawing, perforating, and other operations in one die and, when used in conjunction with an automatic roll-feed, will not only increase production but will permit the use of stock from the coil, thus effecting a saving in the cost of material as well as in operating expense.

Many readers are aware, and others forgetful, of the saving that can be effected by locating the work properly in a blanking die, especially if the part to be blanked is irregular in shape or one end is wider than the other. The strip of stock may then be run twice through the die, or a multiple die may be used; in either case the blanks interlock for the purpose of reducing the amount of scrap.

Nearly all factories use washers in quantities or can easily dispose of them and when practical to do so (the gage of stock permitting) punches and die-bushings should be added to any blanking die that would otherwise allow a waste of stock, thus blanking and perforating washers simultaneously with the other parts. These round punches and die-bushings add but very little to the cost of the die, as the machining is practically all done in the lathe and grinding machine.

In the Drafting Room

In designing castings to be produced in quantities the possibilities of saving material without decreasing the strength of parts is quite often overlooked. Such saving may be accomplished by locating ribs and webs with regard to supporting the walls against shock and strain. This would be false economy, however, if applied to milling fixtures, which should be designed with too much weight rather than too little. A heavy milling fixture will absorb chatter and permit a maximum feed of the cutters without impairing the accuracy of the product. Clamp knobs should be conveniently arranged, and as few of them used as is practical for clamping and locating the work. Wrenches for clamping work in milling fixtures should be used only on large work or where the cuts are too heavy to permit the use of clamping knobs and handles with safety.

Many times hand bending fixtures for wire and light gage metal are designed, whereas if the tool designer had a broader or more practical experience the possibility of performing these operations in a press at a much lower cost would have been recognized.

Pages could be written about drill jigs that are not properly designed. Here again practical experience is a great asset to the tool designer. Drill jigs necessitating the use of separate locating pieces, removable bushings not strictly necessary, or cast iron drill jigs 100 per cent heavier than required, are to be seen in many factories. A drill jig with handles too near the table (legs too short) may cause much loss of time, or a hinged leaf for slip bushings, in jigs where tapping is to be done through the leaf, may become a nuisance when the tap breaks in the work and the leaf cannot be opened to get the piece out.

If the tool designer will cultivate imagination and put himself in the position of the drill press operator he will realize how important are such features as lightness combined with strength, minimum number of clamping and locating knobs.

A Pair of Old Machine Tools

By H. A. Samuels

The illustrations show two old machine tools, both of which are still in use and doing good work in Georgia railroad shops, though both are not in the same shop.

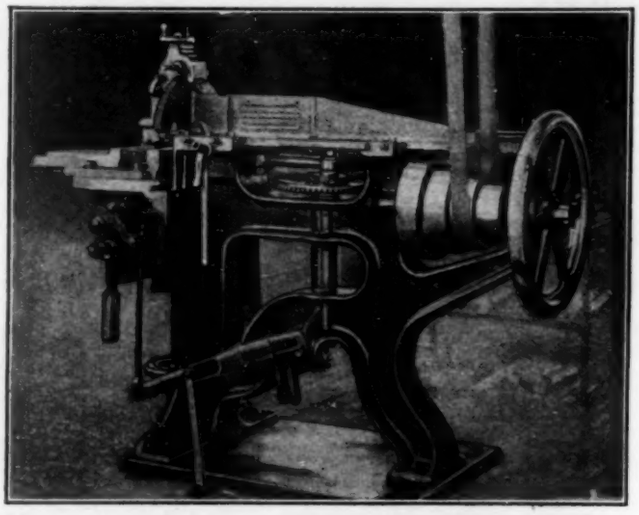


FIG. 1—AN OLD SHAPER

The shaper shown in Fig. 1 has no quick-return motion. The ram is guided at the front and back only and the lever for transmitting the feed motion is fulcrumed to a standard attached to the floor. The swiveling head is operated by worm gearing as may be seen by examining the illustration.

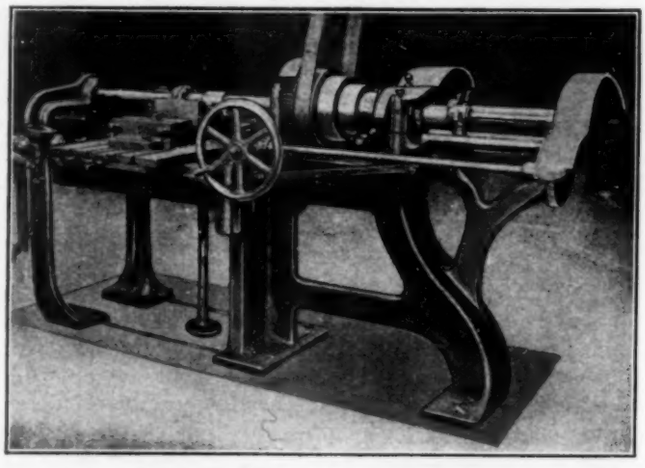


FIG. 2—AN OLD HORIZONTAL BORING MACHINE

The horizontal boring machine shown in Fig. 2 has about all the feeds and adjustments provided in present-day machines of its type and size.

Both machines were built by Bement & Dougherty, Philadelphia, Pa., and are of the vintage of about 1854.

Control of Tool Design

By C. J. DORER
Chief Tool Designer, White Sewing Machine Co.

Standard instructions to draftsmen—Sizes of drawings, part members, etc. — Machinery record, tool record, pattern record and alteration record

THE ARRANGING and laying out of a system for the control of tool design and its many details are difficulties with which every engineering department has to battle. I have seen numerous systems and believe that the greatest difficulty encountered in laying them out is to prevent them from becoming complicated and unwieldy. Files and indexes are easy to start, but the difficult thing to do is to take care of new work with the system in use. The method outlined in this article is one which can be used in any shop that has a standard line of production. It can be modified or expanded to suit the needs of any such plant, in fact, one of the main things to be on the lookout for in laying out such a system is expansion. Every institution hopes to grow in size and so must the systems within it.

Systems of this nature must always be arranged to suit the particular case. Every shop has an individuality of its own, also a set of problems of its own, and no cut and dried rules can be laid down. A system cannot be universal. There are a few points, however, that should be kept in mind. They are standardization, simplicity as far as possible, compactness, and proper instruction. All drawing-room systems should contain these features. It is through them that an efficient system results.

To get the proper start on the drawings, these eleven general rules were adopted and given to the draftsmen:

(1) The standard sizes for drawings are as follows: (C-9½x14½) (B-14½x18½) (A-24x36). These are overall dimensions. See drawing C–215 for full information as to border lines and title.

(2) Place the detail numbers on the assembly drawing in ⅜ diameter circles, locating the circles along a straight or uniformly curved line at equal intervals, and run an arrow from each circle to the piece to which the number in the circle refers. Always place the numbers in numerical order around the drawing.

(3) The following form of detail title must appear under each piece detail:

(No.)————Mat'l————No. Req'd

(4) Call for all operations such as drill, ream, bore, tap, cobore, cosink, thread, chamfer, undercut, grind, etc., in note form at one side of the piece being drawn. Always place the operation name first and the size after—for example:—"drill ½," "ream 0.750"—not "½ drill" or "0.750 ream." Indicate to how many holes the note applies as "drill ½—2 holes." Leave nothing to the imagination of the machinist.

(5) In general wherever dimensions are varied a few thousandths from the decimal equivalent of fractional parts of an inch to suit various fits, keep the female part the even decimal equivalent, and vary the male member to suit.

(6) Always give the pitch and form of thread, and where the piece is not tapped through give the depth of tap.

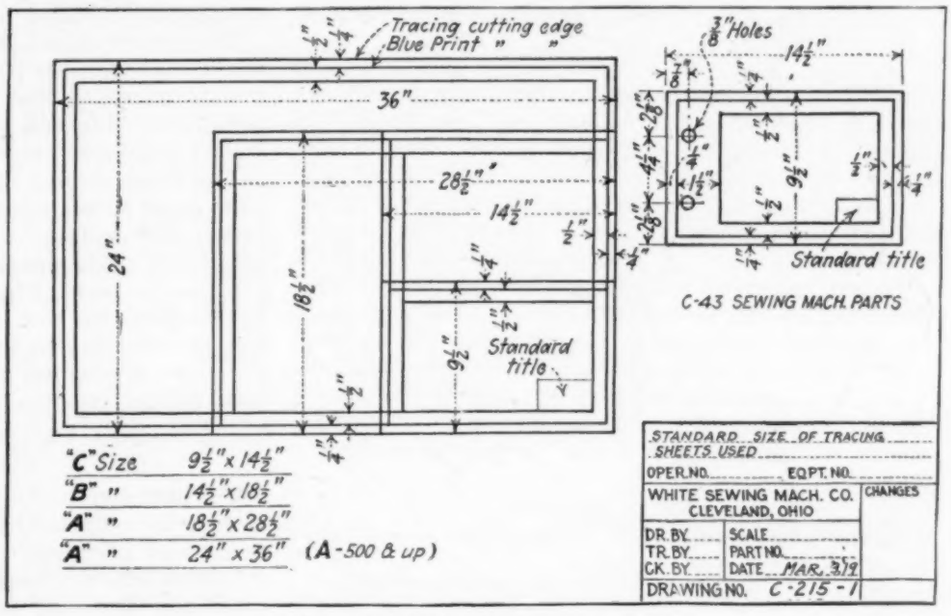


FIG. 1—STANDARD DRAWING SIZES

(7) Avoid placing dimension lines across the drawing wherever possible. Always place your name or initials on the drawing in the place provided for this purpose. Underscore all notes. Give limits for all decimal fractions.

(8) All patterns will have the same number as the assembly drawing of a job. Give the most important pattern the first number. This pertains to all patterns other than those for sewing machine parts.

(9) Show finish on casting by placing an "f" across the finished surface and be sure that the cross

of the "f" comes directly on the line to be finished.

(10) Make all notes like this in form, placing the word "NOTE" in front and making the lines of even length; if there are not enough words to fill the last line, place the remaining ones at the end of the last line of the note.

(11) All drawings of cutters, cobores, gages and special cutting tools used with jigs and fixtures must have separate drawing numbers. Two or more cutters should not appear on the same drawing, and each sheet must be cross-indexed with the rest of the sheets composing the unit.

Written standard practice is imperative on drawings. The general instructions on all drawings should be as near alike as possible in order to facilitate things all along the line and make the drawings more easily understood by those who continually come in contact with them. They also eliminate most of the questioning and the "We did not understand it" attitude.

The Drawings

The size of drawing sheets should be selected to suit the needs. The sizes as shown on print C–215–1, Fig. 1, have proved to be satisfactory. It is advisable to have the smaller sheets ruled and printed to save the draftsman's time.

A very simple method, and the one used by us, is to

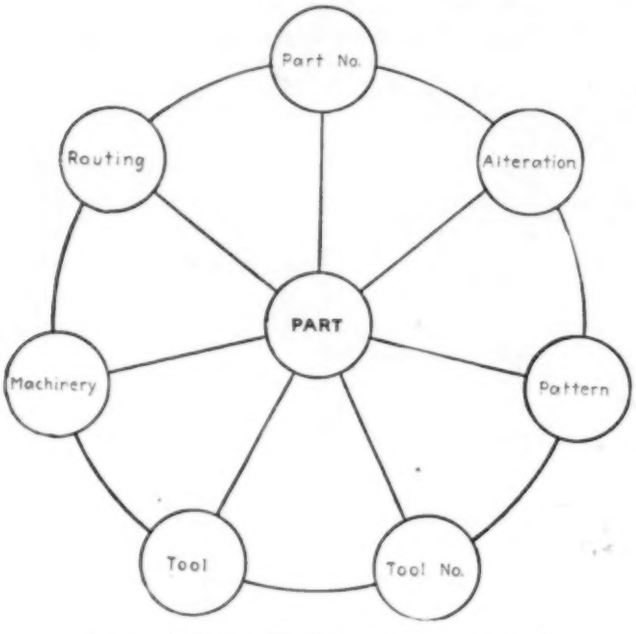
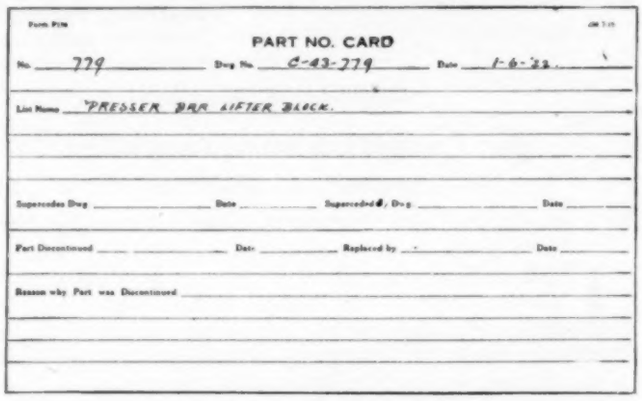


FIG. 2—ITEMS DEPENDING ON EACH PART

keep the drawings in numerical order, regardless of anything else. The sheets are lettered, large and small, A, B and C. The letter designates the size. The "C" size is the smallest. The drawing numbers are taken from a day book, and start at one and go up. For instance, a fixture assembly drawing number would be A-360-1. If there is another "A" sheet it would be No. A–360–2, and so on. If the details are on "B" sheets these would be numbered in the same manner as B–761–1, B–761–2, and so on. The drawings are always filed in their numerical order, and the drawer marked from the lowest to the highest numbered drawing contained therein. The system can be continued indefinitely. It can readily be seen that all drawings of a size pertaining to the same job would always be together. In order to facilitate finding drawings of a different size each job should be cross-indexed, that is, the "B" numbers should appear on the "A" sheets, or vice versa.

In the average shop a part is originated in the Ex-


PART NO. CARD

No. 779 Dwg No. C-43-779 Date 1-6-23

List Name PRESSER BAR LIFTER BLOCK.

Supersedes Dwg _____ Date _____ Superseded by Dwg _____ Date _____

Part Discontinued _____ Date _____ Replaced by _____ Date _____

Reason why Part was Discontinued _____

FIG. 3—PART NUMBER CARD

perimental Department. When this portion of the work is completed and the part is perfected, it goes to the Engineering or Designing Department. Here it is given a part number, and a drawing made of it. The next step is the routing and tooling of the part, and here is where the Designing, or Engineering, Department comes into play. A great variety of items must be considered, and they all revolve about this part as a center, as indicated in Fig. 2.

The system should be so maintained that if any one of the various items is picked up, all the others will be readily traceable from it. This can only be done by careful planning and laying out.

Part numbers should be run in numerical sequence and be taken from a day book. It is advisable to keep from using letters and hyphens, as they are often overlooked and omitted, causing needless delay and correspondence. This number should then be recorded on the part number card, Fig. 3. Provisions should be made for a superseded part, and also for new parts. In this way one part can be traced back to another. The reasons for superseding a part can also be given, and in that way a complete history of the part is always available.

The Routing

The next step is the routing. As a rule, a temporary routing or estimate must be made until the tools are fairly well designed. After this portion of the work is completed, the final production routing should be compiled. It should be as nearly complete as possible and should also be made in such a manner that any good mechanic can pick it up and carry the job through. Do not simply say "Pierce holes," when referring to a piercing operation, but rather say, "Pierce all holes," or "Pierce four holes," as the case may be.

The routing when properly made is, in fact, a condensed form of written standard practice. It originates in the Designing Department and should be a part of it. The Route Card, shown in Fig. 4, is a typical example as used under a premium system, and gives place for complete instructions relative to the job. As additional instructions, photographs, drawings, and setup charts are used. These, however, all have the routing as their basis.

The machinery record, Fig. 5, should be so arranged

as to give a complete history of the machine. It should show make, date of installation, size, where purchased, cost, depreciation, number, and what used for. Provision should also be made to show cost of maintenance. The reverse side of the card can be used to good advantage for this purpose.

The cards are filed according to machine or equipment number. The machine or equipment number is a number given the machine at the date of its purchase, and is stamped on each machine. The procedure for taking care of machine numbers is as follows:

Two distinct records of machines will be maintained —one to be in the Engineering Department, and one divided among the departments using the machines. The record in the Engineering Department will be maintained in numerical sequence, regardless of the department in which the machines are used. Records divided among departments will be maintained in numerical sequence, and will contain the machines used in each particular department.

Procedure in Ordering a New Machine

1. The first step will be the creating of an equipment number, which will be done by taking the next higher number shown in the machinery day book. The equip-

PREMIUM

Card No. 1

Part No. 779 **ROUTE CARD** Mat'l Cost 5.06 PER M.

Part Name PRESSER BAR LIFTER BLOCK. Date 4-13-'23. Labor Cost 18.98 PER M.

Material Required COLD ROLLED STEEL. Price 4.2 ¢ Fact. Overhead 120%

Standard Cost 42.03 PERM.

Dept.	Opr. No.	Opr. Name	MACHINE Class	MACHINE No.	Next Opr.	Next Dept.	STANDARD Man	STANDARD Mach.	STANDARD Set up	COST Rate	COST Piece	Study No.
MILL.	1	SLAB MILL & CUT OFF TO LENGTH					.210				1.63	1
POL.	1	TUMBLE.					approx				.10	
ATTACH.	1	DRILL ALL THREE HOLES.					.635				4.87	1
PRESS.	1	BEND SIDES OF TONGUE.					.200				1.65	1
PRESS.	2	FORM RADIUS ON TONGUE.					.091				.60	1
ATTACH.	2	SLAB MILL TONGUE TO WIDTH.					.1100				8.22	1
ATTACH.	3	FILE BURR ON TONGUE.										
LATHE.	1	TAP 8-32 THD. HOLE.					.162				.96	1
ATTACH.	4	REAM HOLE FOR 775					.190				.75	1
					5	ATTACH.						

FIG. 4—ROUTE CARD

ment number and shop order number will be shown on the order for machine.

2. A shop order, giving the equipment number, will be written to cover installation and setting up of machine ready for operation.

3. When a machine is received, the Engineering Department will be informed, and in turn will instruct the Maintenance Department to install and mark the machine with its equipment number. The machine will be marked in two places: One number will be stamped in some conspicuous place on the right-hand side of machine. The second will be a brass tag with the equipment number attached to the right leg of the machine 18 in. from the floor.

When a machine is to be transferred a shop order covering the transfer will be written by the Engineering Department. The machinery card will go with the machine, and be turned over to the foreman receiving the machine. The Engineering Department will alter its record when writing the shop order for transfer.

In the case of machines idle or unfit for further use, a record will be made on the machinery card, stating the reasons why machine has been abandoned or is out of use. If a machine is to be sold, the selling price and the reason for selling will be stated on the card.

A large number of plants also carry speeds, feeds, etc., on cards of this nature. This subject matter is always very thoroughly expounded in the catalog of the machine, and should be kept on file in the Designing Department. Charts and blue prints of this nature can also be obtained and provide an excellent and inexpensive way of obtaining and keeping this information on hand at all times.

The Tool Record

The tool record must answer a variety of purposes. It must cover all tools of any description pertaining to the job except machines which are taken care of by the machinery record. The tool record card, Fig. 6, should show the number of the part the tool is used for, operation number, drawing number, cost, equipment number if any, and name. It can also show other tools used on the same operation, although this is not essential if all cards pertaining to the same operation are kept filed together. The maintenance cost of the tool can be shown on the reverse side of the card to good advantage. It is advisable to show the initial cost on the front of the card, also the original order number.

As a rule, the number of tools runs up into thousands and the files become unwieldy. When this is the case, certain classes of tools can be kept in separate files. A file for gages, one for cutting tools, and one for all other tools, makes a good division.

The tool cards should be filed according to part number, and under part number they should be filed according to operation number. Where the same tool is used on several different parts it should be cross-indexed.

Tool Numbers

The system of tool numbering employed is really a continuation and combination of the part and drawing numbers. Assuming the number of a part to be 762, and the assembly drawing number of the tool to be A–360–1, the tool number would be 762—A–360–1. The tools are also marked with the department symbol and their date of completion.

It is desirable, if possible, to avoid the use of a mnemonic system which requires a system of cross-indexing as well as a key. It invariably becomes confused because two persons very often do not apply the same name to a tool. It is advisable therefore, wherever possible, to file by number and not by name. With this method of numbering in use it is possible to tell im-

MACHINERY RECORD

Mach. No. 1789 Dept. ATTACH. Date Ord. 7-11-18 Date Recd. 8-29-18 Date Installed 9-25-18

Mach. AUTO. MFG. MILL MACH. Size #6 Wt. 665 # Std. ✓ Spcl. —

Maker THE BILTON MACH. TOOL CO. Bought of THE BILTON MACH. TOOL CO. Req. No. 45610

Purchase Price 825.00 Freight 13.63 Cartage — Erection 11.75 Total Cost 849.40

Depreciation — Appraised Value —

Mach. used for SMALL MILLING OPER. TURN TABLE TYPE

OPER NO.	DESCRIPTION OF OPERATION	STANDARD TIME	DRG NO. OF JOB OR FIXTURE
2	SLAB MILL TONGUE OF 779 TO WIDTH.	1.100	A-387-1

OVER

FIG. 5—MACHINERY RECORD

mediately what part a tool is used for, and also what its drawing number is. In the case of cutters, reamers, and other perishable tools, the foreman, when ordering new tools, has only to specify the tool number which he gets from the old tool, and when the order goes through

TOOL CARD

PART NO. 779 OPERATION NO. 1 DEPT. ATTACH.
TOOL ORDER NO. 80447 DATE 2-3-'22 COST OF TOOL 118.25
DRAWING NO. A-344-1-2-3 EQUIP. NO. —
DESCRIPTION DRILL JIG FOR DRILLING HOLE FOR 779-B PIN IN PRESSER BAR LIFTER BLOCK.

OTHER TOOLS AND GAUGES USED

DRAWING NO.	DESCRIPTION	DRAWING NO.	DESCRIPTION
C-972-1	GAUGE TO CHECK LOCATION OF HOLE		
C-999-1	GAUGE FOR DEPTH OF HOLE.		

FIG. 6—TOOL RECORD CARD

the Engineering Department the drawing can be found direct from the order and sent with it. No searching for the drawing in the card indexes is necessary. The numbers are placed on the tools in a conspicuous place, and in the case of large tools are stamped on with good sized letters. In the case of small tools they are etched on. Every tool must have a number before it leaves the Tool Department.

Pattern Record

The Pattern Record is made out by the Designing Department and kept by the Pattern Department. When a job is designed a card is made out for each pattern and sent to the Pattern Department. See Fig. 7. The Designing Department records the pattern number, part number, drawing number, equipment number, number of castings required, description, material, core boxes and loose pieces, and any other desirable information. The Pattern Department records the compartment and section where the pattern is kept, and takes care of its storage and trips to the Foundry.

The record of use of the pattern is kept on the reverse side of the card by the Pattern Department. The pattern number is of the same series as the drawing number. If the drawing number is A–361–1, the pattern numbers of the various patterns would be A–361–1, A–361–2, and so on. The numbers are stamped on the pattern in a place where they will cast. In this way the identity of a pattern and casting is immediately established through the drawing number. (See Pattern Card).

In making alterations and corrections in parts it is very often desirable later on to know the reasons for such changes; hence, the alteration card, Fig. 8. This

PATTERN CARD

SECT. NO. 4 COMPT. NO. 2 PATTERN NO. A-344-1 DRAW. NO. A-344-1
SHOP ORDER NO. 80447 DATE 2-4-'22. COST OF PATTERN 7.35
PART NO. 779 EQPT. NO. — NUMBER OF CASTINGS REQUIRED ONE
DESCRIPTION BODY FOR JIG FOR DRILLING HOLE FOR 779-B PIN IN PRESSER BAR LIFTER BLOCK.

MATERIAL	CORE BOXES	LOOSE PIECES
WOOD	—	—

REMARKS

FIG. 7—PATTERN RECORD CARD

card is used only in reference to changes in a part in case the changes are not great enough to warrant a new part number.

A record of this nature, in order to be of any use, must be as explicit as possible. Generalities must be avoided.

Example of Alteration Card

The card here shown, when properly filled out, gives a very good idea of the change and what it affects. Space is provided on the front and back for an explanation of the change and the reason for it. A sketch is sometimes advisable. Tools, patterns, drawings, etc. can be checked off as soon as they are corrected to suit the change or alteration. Other parts affected by the change should also be noted. In this way a completed record, and what it effects, is always available at a moment's notice.

Alterations and corrections on tool drawings are made on that drawing and noted with the date at the point of alteration.

In general, it should be remembered to keep a system of this nature as simple as possible. The Designing Department is the department looked up to by the rest of the shop for instructions, and should set an example of efficiency, progressiveness and economy. If the department does not practice these virtues within itself, it cannot hope to inculcate them into the rest of the organization.

ALTERATION No. A SEWING MACH. PART No. 779
NAME OF PART PRESSER BAR LIFTER BLOCK. DRAWING No. C-43-779 DATE 1-6-'22.
STATE FULLY REASON FOR, OR OBJECT OF MAKING ALTERATION CHANGE MATERIAL OF THIS PART FROM MALLEABLE TO COLD ROLL ST. REASON IS THAT THE MANUFACTURING COST WILL BE LESS AND A MORE ACCURATE PRODUCT WILL BE OBTAINED.

INDICATE BY CHECK MARK THE NATURE OF ALTERATION

JIGS	✓	STOCK	✓	DIMENSIONS	✓
FIXTURES	✓	DESIGN	✓	GAUGES	✓
MACH. TOOLS	✓	PATTERNS	✓		

OTHER PART Nos. ALTERED BECAUSE OF THIS CHANGE NONE.

PROPOSED BY X DATE 4-13-'22. APPROVED BY X DATE 4-13-'22.
NOTE: USE REVERSE SIDE OF CARD IF NECESSARY FOR CLEAR STATEMENT

FIG. 8—ALTERATION RECORD

Personality and Pessimism—Discussion

By John C. Spence

The article under the above title by Charles W. Lee on page 967, Vol. 57, of the *American Machinist* will probably appeal to many men who are in charge of production.

After a man has handled hard, uncompromising materials for the greater part of his life he usually acquires a state of mind that looks on each question as either being "so" or "not so." He learns early that while "Hope springs eternal in the human breast" it does not make good on spoiled work, poor castings, poor designs or lost time. The kind of life a man leads, naturally makes him rather doubtful of some of the rosy pictures that the professional optimist paints and for this reason he may become known as a pessimist, although he may be what Mr. Lee calls a "rationalist."

My own experience has led me to believe that in general a "pessimist" is simply a person that history proves *was* right.

Can Taper Pin Practice Be Standardized?

THE question of standardizing taper pins is being given attention in some of the government departments and it is desirable, if possible, to arrive at a standard which either conforms to usual practice or which can be adopted by all users of taper pins. The advantages to both makers and users would be numerous.

A study of existing practice brings out a number of interesting features, and some discrepancies. There is, however, a good basis for standardization in the fact that a taper of ¼ in. per foot (or 0.020833 in. per in.) seems to be universally accepted. Rounded ends are almost universal, and the radius at each end is usually the same as the diameter of the pin at that end. A few make the radius twice the diameter.

One exception to the rounded ends is in the practice of the Brown & Sharpe Manufacturing Co., who make the small end a hemisphere and leave the large end flat with rounded corners having a radius varying from 0.010 to 0.050 in., according to the size of the pin. This is presumably with the idea of marring the head less in driving than where it is rounded.

The Army Ordnance Department uses beveled or tapered ends in place of the rounded, in the belief that there is less deformation in driving or removing pins. The length of this taper is the same as the diameter of the pin at the small end.

As to the protection afforded the ends, it is quite probable that if either rounded or tapered ends are deformed in disassembly, the hole will require to be re-finished and a new pin be required to make a good job. There is little doubt, however, as to the rounded ends presenting much the best appearance, especially when the pins can be driven so that the tapered portion just fills the hole and leaves only the rounded ends projecting.

The lengths of taper pins, however, are not designated in the same way in all cases, some manufacturers giving the length over all, others the length of the tapered portion only. The latter method seems to be most used.

The designation of sizes is another matter of controversy. The usual custom is to give the measurement at the large end. This is an advantage to the makers of pins as it enables them to use a single size of wire for any length pin of a given size. The user, on the other hand, would find it advantageous to have sizes designated by the small diameter. This would enable the same size drill to be used without regard to the length of the pin.

When taper pins are used in a position where the end of the reamer has little clearance it means that the end of the reamer must be ground off for shorter pins. This necessity would be obviated if the pins were designated by their small diameter.

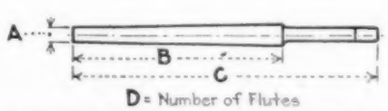
Taper-pin reamers are usually made long enough to "overlap" about ½ in., which means that a No. 1 taper-pin reamer, for example, is 0.146 in. diameter at the small end while a No. 2 is 0.162 in. The pins, however,

TABLE I—TAPER PIN DIAMETERS AT SMALL ENDS—WESTERN AUTOMATIC MACHINE CO.

Taper ¼ per foot = 0.020833 per inch										Tolerance ± 0.0015 in.						
Number	00.000	0.000	000	00	0	1	2	3	4	5	6	7	8	9	10	11
Diam. Large Ends	0.094	0.109	0.125	0.141	0.156	0.172	0.193	0.219	0.250	0.289	0.341	0.409	0.492	0.591	0.706	0.860
Size - Stock	1/64	1/8	9/64	0.150	0.165	0.180	13/64	0.230	0.260	0.300	0.350	0.420	1/2	0.600	23/32	7/8
Lengths ½	0.078	0.093	0.109	0.125	0.140	0.156	0.177	0.203	0.234	0.273	0.325	0.393	0.476	0.575	0.690	0.844
1	0.073	0.088	0.104	0.120	0.135	0.151	0.172	0.198	0.229	0.268	0.320	0.388	0.471	0.570	0.685	0.839
1 ⅛		0.083	0.099	0.115	0.130	0.146	0.167	0.193	0.224	0.263	0.315	0.383	0.466	0.565	0.680	0.834
1 ¼			0.093	0.110	0.125	0.141	0.162	0.188	0.219	0.258	0.310	0.378	0.461	0.560	0.675	0.829
1 ⅜				0.104	0.120	0.136	0.157	0.183	0.214	0.253	0.305	0.373	0.456	0.555	0.670	0.824
2					0.114	0.130	0.151	0.177	0.208	0.247	0.299	0.367	0.450	0.549	0.664	0.818
2 ¼						0.125	0.146	0.172	0.203	0.242	0.294	0.362	0.445	0.544	0.659	0.813
2 ½						0.120	0.141	0.167	0.198	0.232	0.289	0.357	0.440	0.539	0.654	0.808
2 ¾							0.136	0.162	0.193	0.232	0.284	0.352	0.435	0.534	0.649	0.803
3							0.131	0.157	0.188	0.227	0.279	0.347	0.430	0.529	0.644	0.798
3 ⅛								0.151	0.182	0.221	0.273	0.341	0.424	0.523	0.638	0.792
3 ½								0.146	0.177	0.216	0.268	0.336	0.419	0.518	0.633	0.787
3 ¾									0.172	0.211	0.263	0.331	0.414	0.513	0.628	0.782
4									0.167	0.206	0.258	0.326	0.409	0.508	0.623	0.777
4 ¼										0.201	0.253	0.321	0.404	0.503	0.618	0.772
4 ½										0.195	0.247	0.315	0.398	0.497	0.612	0.766
4 ¾										0.190	0.242	0.310	0.393	0.492	0.607	0.761
5										0.185	0.237	0.305	0.388	0.487	0.602	0.756
5 ¼											0.232	0.300	0.383	0.482	0.597	0.751
5 ½											0.227	0.294	0.377	0.477	0.592	0.746
5 ¾											0.221	0.289	0.372	0.471	0.586	0.740
6											0.216	0.284	0.367	0.466	0.581	0.785

TABLE II—GENERAL DIMENSIONS OF TAPER PINS—FROM THE HARTFORD MACHINE SCREW CO.

Taper ¼ in to the Foot



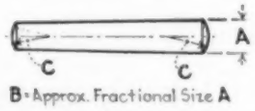
D = Number of Flutes

Size	A	B	C	D
000000				
00000	0.075	1 1/16	1 5/16	4
0000	0.088	1 1/4	1 3/4	4
000	0.101	1 5/16	2	4
00	0.114	1 7/16	2 1/4	4
0	0.127	1 5/8	2 5/8	6
1	0.146	1 3/4	2 1/2	6
2	0.162	2	3	6
3	0.183	2 1/4	3 1/2	6
4	0.208	2 1/2	4	6
5	0.240	3	4 1/2	6
6	0.279	3 5/8	5	6
7	0.331	4 1/2	6 1/4	6
8	0.398	5 1/4	7	8
9	0.482	6 5/8	8	8
10	0.581	7	9	8
11	0.706	8 1/4	11 1/4	8
12	0.842	10	13 3/8	
13	1.009	12	16	
14	1.250	14	18 1/4	

Fig. 2

TABLE III—GENERAL DIMENSIONS OF TAPER PIN REAMERS—HARTFORD MACHINE SCREW CO.

Taper ¼ in. to the Foot



B = Approx. Fractional Size A

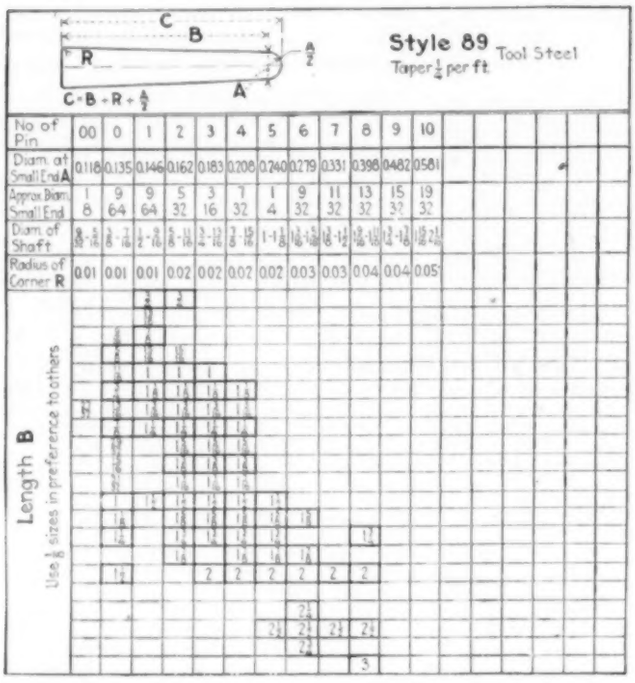
No.	A	B	C
00000	0.094	3/32	0.094
0000	0.109	7/64	0.109
000	0.125	1/8	0.125
00	0.141	9/64	0.141
0	0.156	5/32	0.156
1	0.172	11/64	0.172
2	0.193	3/16	0.193
3	0.219	7/32	0.219
4	0.250	1/4	0.250
5	0.289	9/32	0.289
6	0.341	11/32	0.341
7	0.409	13/32	0.409
8	0.492	1/2	0.492
9	0.591	19/32	0.591
10	0.706	23/32	0.706
11	0.860	7/8	0.860
12	1.032	1 1/32	1.032
13	1.241	1 15/64	1.241
14	1.523	1 33/64	1.523

Fig. 3

measure 0.172 in. for the No. 1 and 0.193 in. for the No. 2 at the large end. While this works out for pins of the lengths usually found in practice, it does not come out so conveniently where long pins are necessary, as can be seen by studying Table I, which shows the practice of the Western Automatic Machine Screw Co., Elyria, Ohio. The table shows that a hole for a No. 2 pin more than 1½ in. long requires the use of more than one reamer. If it is not more than 2¼ in. long, a No. 1 reamer in addition to a No. 2 will handle it, but if longer than this, still another reamer will be necessary. The table shows lengths which are considered standard, all below the heavy line being special.

Table II, from the Hartford Machine Screw Co., shows the main dimensions of pins, including approximate fractional sizes and the radius of the rounded ends. Table III gives the main dimensions for taper-pin reamers. The Brown & Sharpe Manufacturing Co.'s tool-steel taper pins are shown in Table IV, which gives considerable information of value to those using taper pins. This table shows the lengths of pins

TABLE IV—DIMENSIONS OF BROWN & SHARPE TOOL STEEL PINS



No. of Pin	00	0	1	2	3	4	5	6	7	8	9	10
Diam. at Small End A	0.118	0.135	0.146	0.162	0.183	0.208	0.240	0.279	0.331	0.398	0.482	0.581
Approx. Diam. Small End	1/8	9/64	9/64	5/32	3/16	7/32	1/4	9/32	11/32	13/32	15/32	19/32
Diam. of Shaft	5/64–1/8	3/32–1/8	1/8–1/16	5/32–11/64	3/16–13/64	7/32–15/64	1/4–1 1/8	1 1/8–1 3/8	1 3/8–1 5/8	1 5/8–1 7/8	1 7/8–2 1/8	2 1/8–2 3/8
Radius of Corner R	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.05

made in the different sizes and carries the suggestion that pins in even ⅛-in. lengths are to be used in preference. The formula given for the length of the pins shows the length of the flat head with its rounded corners to be equal to the radius of the corners so that the pin projects very little from the shaft or collar. The size of shaft in which each pin is to be used is also given.

Table V, also from the Brown & Sharpe Manufacturing Co., is convenient as showing the drill to use for different sizes of pins. These drills vary from 0.002 in. to 0.003 in. smaller than the small end of the pin.

The greatest discrepancy in practice seems to be in measuring the length of the pin. This should be easy to standardize and it would seem that the length of the tapered portion is more logical than the over-all length. In either case, the method of measurement should be universal. It would, as already pointed out, be better for the user to have the diameter measured at the small end. But the economic advantage of being able to make all lengths of a given size pin from a single size of stock will make such a change difficult.

It might seem better to make reamers long enough to handle any length of pin of a given size, but here again we have the economic advantage of the shorter reamer which takes care of the average length of hole. Then, too, there is the occasional necessity of cutting off reamer ends for shorter pins in blind holes or restricted places, making the short reamer an advantage.

The tapered ends have few advocates and their adoption seems most unlikely. The radius of the ends should, however, be uniform. As a radius equal to the large diameter is easy to remember, it would seem to be the one to adopt for both ends of the pin.

TABLE V—DRILLS FOR TAPER PIN HOLES—BROWN & SHARPE

No. of Pin	Size of Drill	No. of Pin	Size of Drill
		5	0.237
		6	0.276
		7	0.328
00	0.116	8	0.395
0	0.133	9	0.479
1	0.143	10	0.578
2	0.159		
3	0.180		
4	0.206		

The Engineer as an Economist

BY J. A. L. WADDELL

The importance of applying economic principles to engineering work can scarcely be too strongly stressed. The remarks made on this subject by a consulting engineer of New York City, Dr. Waddell, when addressing a group of engineering students at the University of Barcelona, are much to the point and will bear repeating.

In the future, to be eminently successful in our profession, one must be not only a competent engineer but also a true economist. Up to the present it has usually sufficed to make one's construction strong and durable—too often irrespective of cost; but today, when there is so much building to be done and so little money available, it behooves engineers to study the theory of true economy in their designs and apply its principles in all their works.

Distinction should be made between true economy and false economy. Many people think that the most economical thing is the one that costs least; but such is by no means the case. The definition of economy from the engineering standpoint, as given in two of my books, is "The science of obtaining a desired result with the ultimate minimum expenditure of effort, money, or material."

When determining, from the standpoints of economy, which one is the best of a number of proposed constructions or machines, there should be computed for each case the four following quantities and their sums:

(a) The annual expense for operation.
(b) The average annual cost of repairs.
(c) The average annual cost of renewals.
(d) The annual interest on the money invested.

That one for which the sum of these items is least is the most economic of all the proposed constructions or machines; but this statement is truly correct only when the costs of operation, repairs, and renewals are averaged for a long term of years; or else for a comparatively short period of time, when the conditions in respect to wear at the end of the period are practically the same for all cases.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Section seven takes up production control—Sales and production schedules—Move orders, time tickets and schedule cards—Dispatching methods

IT HAS BEEN STATED in previous articles that the adequate control of production is an important aid to satisfactory cost accounting, and in the previous article some of the contacts between the cost department and the planning department were pointed out. Here we propose to survey briefly the problem of production control in order that the reader may have more clearly in mind what is meant by the interrelationship between production and costs, a grasp of which it is rather difficult to obtain without a general idea of what is involved in the control of production.

The first step in the control of production is one which involves other factors of the business in addition to production, particularly sales. Before the production for a period can be planned with any degree of definiteness it is essential that the sales and production be balanced, or in other words, the sales potentiality and productive capacity be compared and a program prepared which will be within the limits of each. It is useless to sell what cannot be produced within the time allowed and it is equally useless to make what cannot be sold. It is also without beneficial results to plan to make and sell a quantity of goods which cannot be financed.

A Master Schedule

It is desirable, therefore, to prepare what is often called a "master schedule," a schedule which will serve to guide and control all the subsidiary schedules, especially those for production and sales. There are very many forms in which a master schedule may be worked out, one of which is illustrated in Fig. 4. Here the master schedule is represented by the straight diagonal line which records the quantity of production and sales to be produced during the month in question.

Such a line looks very simple, but it really is the result of a great many factors and a careful measurement of them and a balancing of the relationships among them. The first step is to ascertain what the factory can actually produce, a figure which can only be determined with sufficient accuracy if the various operations have been studied, and, as far as possible, standardized. In other words, if manufacturing standards have not been established, any attempt to gage the capacity of the shops is essentially guesswork. Long experience may make possible a fairly accurate guess but it is not usually very reliable.

The only satisfactory way in which to accomplish the task is to standardize shop conditions—machines, tools, work-places, and materials—and then set definite operation standards which find their permanent form in instruction cards like those illustrated in Fig. 5. In passing, it might be said also that instruction cards are very useful to the cost department when it is called upon for estimates, for both labor and burden costs may be calculated from them.

It is equally essential to know the sales probabilities both as to quantities and times of delivery. The mere budgeting of sales or the setting of quotas is not sufficient, for if sales and deliveries are all made at the beginning of the period in question it will obviously be impossible for the factory to supply the goods when they are wanted. A tentative sales schedule should, therefore, be prepared showing the probable quantities and times of delivery. Such an estimate should be based on a careful study of the various districts to be

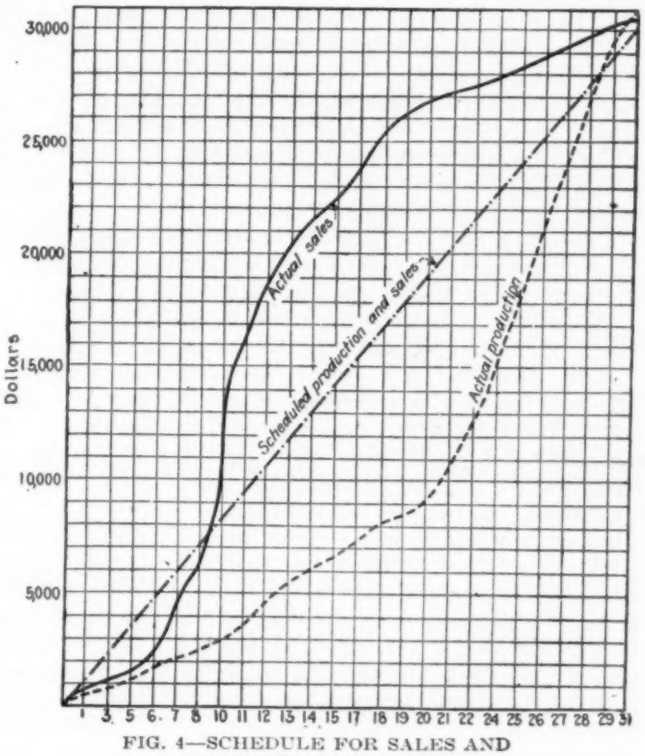


FIG. 4—SCHEDULE FOR SALES AND PRODUCTION BALANCE

covered and their needs, the probable future trend of business in general and of the industry in which the company is in particular, and of the past records of the concern.

It is quite possible that the sales and production schedules may be easily harmonized and still the program be quite beyond the capacity of the company. It must never be forgotten by either factory or sales department men that the finances of the concern are quite as vital to its successful operation as either sales

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INSTRUCTION CARD

SUPERSEDES
ISSUE OF
NAME OF PART Cover
DESCRIPTION OF OPERATION Form Arc
PART SYMBOL NS-1416-C
OPER. SYMBOL FR-1
T. S. No.
MACHINE NAME Consolidated Punch Press
MACH. CLASS FR-30-X-2.
TIME EACH .233 MIN. PIECES PER HR. 258 TIME EACH .00388 HRS.

No.	SUB-OPERATIONS	MACH. SPEED R. P. M.	FEED IN.	TIME ALLOWED MINUTES
1	Pick up piece and dip in lubricant with right hand, and place face up on die with both hands.			.12
2	Place hands, one on each lever, and trip press.			.04
3	Remove piece from die with both hands and place in skid with left hand.			.05

TOTAL OPERATING TIME PER PIECE .21

OPERATING TIME PER PIECE .21 MIN.
ALLOWANCES—
STAMPING TIME TICKETS PER PIECE .002
MACHINE TIME PER PIECE
HANDLING TIME PER PIECE .0210
MISC.
TOTAL TIME ALLOWED PER PIECE .233

NOTE:—THIS TIME WILL NOT BE CHANGED NO MATTER HOW LONG THE JOB MAY RUN WITH THE EQUIPMENT, METHOD AND DESIGN SPECIFIED IN THESE INSTRUCTIONS.

ISSUED 4-22-19 BY J.H.P. APPROVED PART SYMBOL NS-1416-C

IF THESE INSTRUCTIONS CANNOT BE FOLLOWED NOTIFY FOREMAN AT ONCE

Courtesy of the Square D Co.

FIG. 5A—INSTRUCTION CARD FOR PUNCHED WORK

or production. If materials are purchased and must be paid for at the beginning of the period and sales come near the end with relatively long terms granted, it often happens that the necessary funds cannot be made available and both selling and production schedules must be modified in consequence. Hence we see that before a final master schedule can be set up, buying schedules, payroll schedules and expense schedules must be prepared in a tentative manner.

When the temporary schedules have all been prepared, it is then necessary to reconcile them in such a way that the master schedule may result. It usually means a modification of a number of the component schedules in order to secure harmony among them. The individual schedules when so established are the basis for the control of the various operations which they represent. The cost accountant has a direct interest in all this through the part which he has in the setting of the expense schedule and an indirect interest because of the effect of the production schedule upon his work.

When the master schedule has once been set up for a definite period, it is then necessary to work out the details of the individual schedules. In the case of production it may be possible for an industry producing a standardized product for stock to work out such a schedule in considerable detail. In the case of a jobbing industry it is almost always impossible to plan for any great length of time ahead and the details must be filled in as it becomes possible. Except in extreme cases, however, it is possible to plan much more carefully for the future than is usually done if the problem is thoroughly studied. In any event, it is desirable to show actual accomplishment compared with the scheduled plans, and this is illustrated in Fig. 4 by the lines representing actual sales and production.

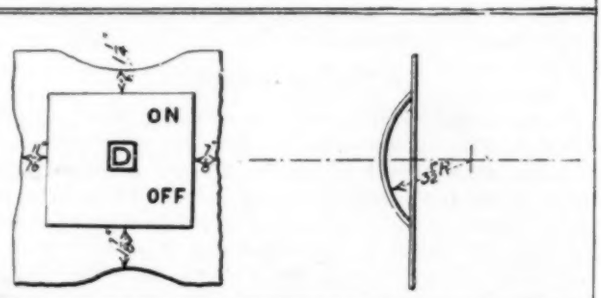
To show how a careful study of the elements used in the control of production may be made, Fig. 6 is included. It is the card on which the Union Special Machine Co. makes an analytical investigation of each part which it produces for use in assembling its machines. In the upper left-hand portion of the card is a summary of the places where the part is used. At the right is information in regard to the material from which the part is to be made and data which should serve to guide the placing of orders for it, particularly in respect to economical lots. At the bottom of the card and on the reverse side, complete information as to the various operations involved in the making of the part is given. The last section is really a summary of the kind of details which Fig. 5 illustrates.

INSTRUCTION CARD
(SET UP MACHINE)

SHEET NO. 2
T. S. No. 997
NAME OF PART Cover
TOOLS REQUIRED
1 - D-592-Punch & Die
4 - 3/4" x 3" Hex. Bolt
4 - 3/4" Washer
1 - Instruction Card

PART SYMBOL NS-1416- C
OPER. SYMBOL FR-1
MACH. CLASS FR-30-X-2

SKETCH



INSTRUCTIONS TO SET UP MAN

Have operator who is to run job sign 4 tool requisitions and turn these into the tool crib, getting the above tools.

Put punch and die in position and adjust. Take down tools when batch is completed.

Assist operator when starting job and check work to see that it is satisfactory.

Note: Mix about 5 gals. of Acme solution.

TIME ALLOWED HRS

INSTRUCTION TO OPERATOR

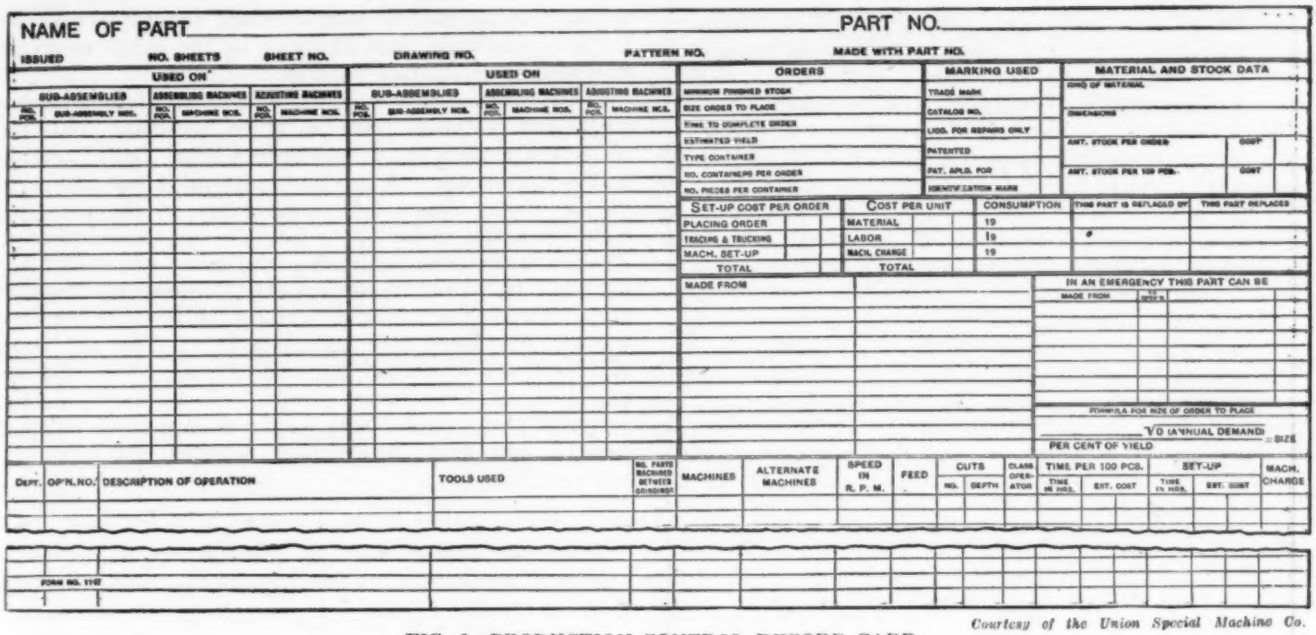
When starting batch, have clerk at the production booth stamp time ticket. Assist set-up man in setting up and taking down tools. Return tools when batch is completed and get tool requisitions. Have clerk at production booth stamp time ticket.

ISSUED 4-22-19 BY J. H. P. APPROVED PART SYMBOL NS-1416-C

IF THESE INSTRUCTIONS CANNOT BE FOLLOWED NOTIFY FOREMAN AT ONCE

Courtesy of the Square D Co.

FIG. 5B—SHEET 2 OF INSTRUCTION CARD FOR PUNCHED WORK



Courtesy of the Union Special Machine Co.

FIG. 6—PRODUCTION CONTROL RECORD CARD

It is needless to say that such a record represents a great deal of labor in compilation. At the same time the company has found it to be worth the cost. For those who may say that such a plan is all right for simple products but would be far too complex for a company manufacturing a great variety of goods, it may be said that the concern in question has 47,000 different parts and sub-assemblies in its inventory. In reality, the more complex the problem the greater the need for a permanent record which can be used whenever it is needed and which provides all the essential information for the preparation of the manufacturing orders through which are worked out the detailed control of production and the setting of the production schedules.

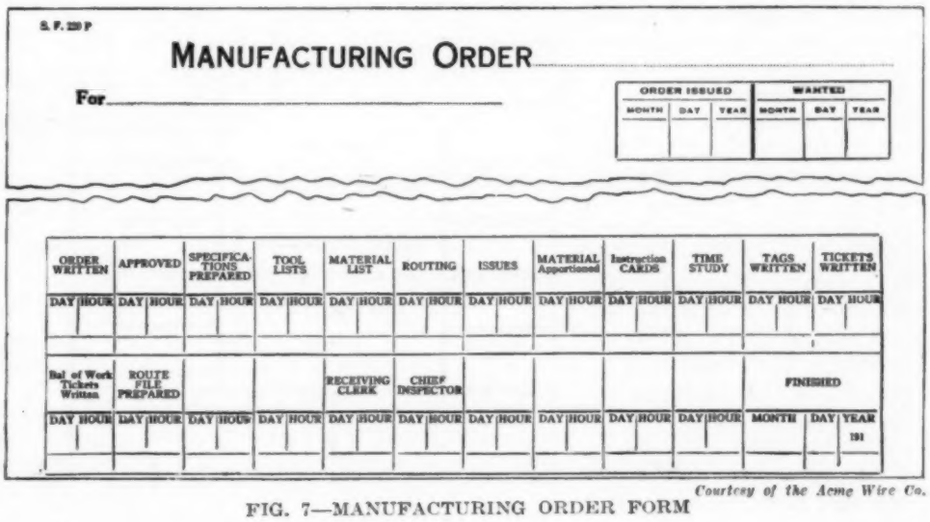
The Manufacturing Order

The manufacturing order which is illustrated in Fig. 7 is an excellent example. Most interesting of all is the list of steps to be taken in working out the details of the order. Few people realize until they see such a list how complicated is the detailed control of production.

Many of the steps may seem to be far removed from the cost department, but it must be remembered that if they are not taken correctly the effect of their inaccuracy is almost sure to be felt in the cost department through either the time tickets or material slips of one kind or another. It should not be forgotten also that the farther back in the course of the operations the mistake is made, the harder it is to correct it. It should be more clearly realized now by the reader that the statement made in an earlier article was correct when it was stated that the cost accountant, if he is to perform his task satisfactorily must be familiar with the manufacturing processes and particularly with the methods for their control, as otherwise he will not be in a position to know whether or not the material coming to him is correct.

It not infrequently happens that one of the details which the writing of a manufacturing order calls for is the matter of special tools or other equipment. In such a case it is often necessary to write a special order for them, a satisfactory form for which is illustrated in Fig. 8. The cost department is especially interested in such orders for it has the task of ascertaining their cost, and afterwards of finding out whether the cost is to be charged entirely to the manufacturing order, or entirely to some fixed asset inventory or part to one and part to the other, or even disposed of in some other way. Because special tool orders are *special* and hence out of the ordinary they require particular attention on the part of both planning and cost departments.

Material control is often so complex that the whole of the next article will be devoted to it and nothing will be said of it here. The other elements to be



Courtesy of the Acme Wire Co.

FIG. 7—MANUFACTURING ORDER FORM

TOOL AND PATTERN SHOP ORDER

DATE ISSUED	MADE BY DEPT	PART NUMBER
WORKMAN'S NO.	DRAWING NUMBER	ORDER NUMBER
INSPECTOR'S NO.	PATTERN NUMBER	DEL. TO DEPT

PLEASE MAKE

TO BE MARKED DATE FINISHED

DRAW SKETCH HERE

REMARKS

Courtesy of the Union Special Machine Co.

FIG. 8—SPECIAL TOOL ORDER FORM

planned and scheduled are the production centers, workers and orders. It is essential, of course, that the equipment be kept in a useable condition at all times. If it is not, occasions are sure to come when it will be wanted and will not be ready. The result will be idle time of both machines and men. The cost department has the duty of recording in dollars and cents all these losses and often the task is not an easy one. It is also essential that the particular production center to which work has been scheduled shall be unoccupied at the time the work gets there. It is necessary, therefore, that not only shall the work be scheduled through the factory but also that the production centers have their time scheduled in advance.

It is hardly possible to expect the plans for production to work out successfully unless the workers are scheduled beforehand. Many factory managers seem to assume that because workers are easily moved from place to place any emergency can be taken care of by simply shifting them from one job to another. The shifting process often means loss of time and, of course, offers no substitute for a real lack of workers. The presence of the requisite *number* of workers, on the other hand, is no guarantee that those available have had the right kind of training for the jobs ahead. Hence we see that workers should be planned for and scheduled just like any of the other elements involved in production control.

If the work of the factory is to move along continuously and without friction, it is essential that the necessary orders and sub-orders—for from certain points of view time tickets and material issues are nothing more nor less than subdivisions of the principal manufacturing order—be ready for use when needed. When a large order is divided into many lots or batches for ease in dispatch through the factory the task of preparing all the many sub-orders needs to be planned for and scheduled also. Figs. 9 to 13 illustrate some of the forms which the sub-orders take. The cost department is very much interested in their proper preparation for from them, as has been pointed out previously, the cost department receives much of its information.

Dispatching Work Through the Factory

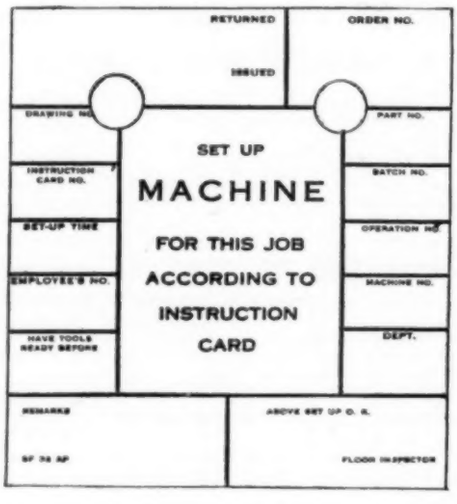
It is not enough for the control of production to plan and schedule it. It is also necessary to dispatch it through the factory, a proceeding which consists essentially of sending out orders to perform certain tasks at definite times sufficiently in advance so that the work may be accomplished as desired and then receiving reports so that it may be known that the orders given have been filled.

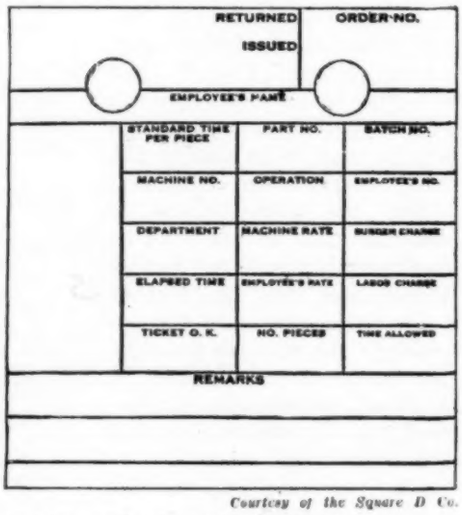
In some cases it is necessary that a sub-foreman or experienced mechanic set up the machine, put the tools in it correctly, make all needed adjustments and make sure that it is ready to operate properly. In such a case an order like that illustrated in Fig. 9 should be sent out in advance so that the machine may be ready in time.

Work Directed Through Time Tickets

Time tickets are a common means of actually directing the work. They represent the orders and on them are shown the production center, the name and number of the worker, while the material is also indicated in a certain sense by the operation number showing its stage of completion. There is an almost infinite variety of time tickets. A very satisfactory one is shown in Fig. 10. From the time tickets the cost department obtains both labor and burden costs in many instances.

When any operation is finished on a lot or order it is necessary to move it to the next operation. In the





Courtesy of the Square D Co.

FIG. 9—MACHINE SET-UP ORDER FORM. FIG. 10—TIME TICKET

Inspection

C

Op.

Route Sheets | I HAVE INSPECTED THE WORK DONE ON THE FIRST PIECE AND FIND AS FOLLOWS:

Pcs.
Batch No.
Mach

INSPECTOR

FOLLOWING BATCHES MUST BE ACCOUNTED FOR ON THIS COMBINATION TICKET

FINAL INSPECTION: I HAVE INSPECTED THE WORK DONE ON ABOVE OPERATION AND FIND AS FOLLOWS:

Pieces Dropped	Sawed Close	Wound Large O. D.	Short Leads	Broken Tubes	Open
High	Low	Breakdown			Pcs. O. K.

Route Sheets

INSPECTOR

Courtesy of the Acme Wire Co.

FIG. 11—INSPECTION TICKET

continuous process type of industry the control of transportation is often very simple. A constantly moving conveyor takes the goods as soon as a unit is completed to the next operation. For other types of industry it is necessary to dispatch the movement of material in the same way as the operation. It frequently happens, moreover, that at the end of any operation the work must be inspected before being passed on. The order to pass on the condition of the work and the report of the findings is usually made on an inspection ticket (illustrated in Fig. 11), which is of considerable importance to the cost department in case the workers are paid by a piece-rate or bonus method of payment. The direction to move the material and the indication of its accomplishment are often made

MOVE CARD

PLEASE MOVE THIS MATERIAL TO MACHINE FOR NEXT UNSIGNED OPERATION

PIECE SYMBOL LOT NO.

NO. OF PCS. CHARGE TO

DESCRIPTION

OPER. NO	STANDARD MACHINE	LOCATION	ALTERNATIVE MACHINE	SIGNED MOVEMAN	SIGNED FOREMAN	ENTERED ON ROUTE SHEET
	STORES					
1						
2						
3						
4						
5						
6						
7						
8						
9						
0						

Courtesy of the G. W. P. Co.

FIG. 12—MOVE TICKET

by means of a move ticket. In Fig. 12 is shown one form of a move ticket.

It is obvious that some record is necessary of these various details as they take place, as otherwise it would be almost impossible to keep track of what had been done and what was yet to be accomplished. A method of doing so is illustrated in Fig. 13. The operations are listed at the left and then in the center under "record of progress" is shown each one that is necessary to complete the order as it is taken. When a dispatch board is available, the means are at hand for the detailed control of each step in the production of the finished goods, for as the schedule card shows the condition of the order, so the dispatch board shows the condition of the shop at all times.

A whole volume could easily be devoted to the subject matter of this one article, so it is obvious that all which can be hoped for herein is a brief outline of what is involved in production control. With the article which has preceded this and the one which is to follow it

C

OPERATION AND SYMBOL	RECORD OF PROGRESS: Move, Operation, First Insp., Final Insp., Pcs. O. K.	WINDING: MACH. CLASS	ASSEMBLY: MACH. CLASS	TIME ALLOWED: PIECE	TIME ALLOWED: BATCH
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

BATCHES NO. QUANTITY IN

S. O. NO.

Courtesy of the Acme Wire Co.

FIG. 13—RECORD OF PROGRESS FORM

is hoped that the reader will have suggested to him some of the significant relationships between production control and cost accounting which will aid him materially as he continues his study of the latter subject.

Importance of Asiatic Markets

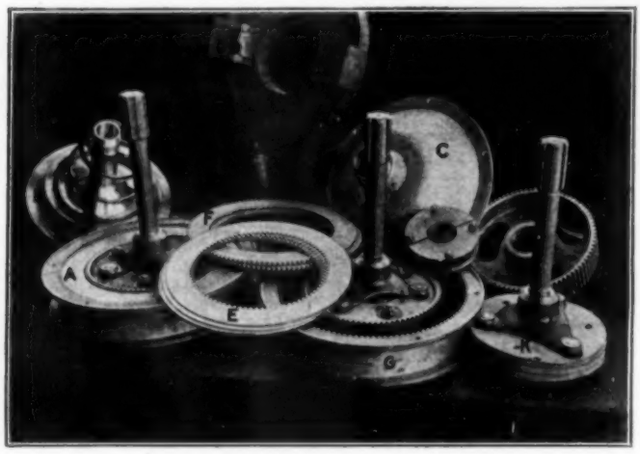
Notwithstanding the fact that Japan—the best of the Asiatic markets for American machinery—ranks only fourth among the markets of the world, it should be emphasized that the Asiatic group shows signs of rapidly increasing importance and possibly deserves more attention than the present volume of business might suggest. Of our total machinery exports the Asiatic markets took 7.4 per cent in 1910, 6.8 per cent in 1913, 22.9 per cent in 1919, 18.5 per cent in 1920, and 26.1 per cent in 1921. All five of the leading Asiatic markets rank better than 13 among the machinery exports of United States.

Assembling the Locomobile Clutch

By Milton Wright

There is much difference of opinion as to the relative merits of the various kinds of clutches used upon automobiles. Cone clutches, disk clutches, single and multiple disks, dry, or running in oil, all have their advantages and their advocates. It is the province of the manufacturer to decide which form shall be used upon the individual car. The scope of this article is merely to describe the construction of the type of multiple-disk clutch used upon a well-known machine, the Locomobile.

In the illustration, letters *A*, *B* and *C* represent the parts of a clutch ready for assembly. The remaining letters indicate the component parts of *A*. In the final assembly, part *B* is placed over the protruding shaft and the aluminum cover *C* is set over it. The clutch is then so placed on the bench that the wooden lever *D* (only a part of which appears in the picture) may be lowered to a horizontal position with the shaft extending through the hole. A leather strap depends from the outer end of the lever, and has a loop at the



THE LOCOMOBILE CLUTCH

bottom into which the assembler places his foot, thus bringing his weight to bear upon the cover and compressing the coil spring so that he can enter the six hexagon-head bolts that hold parts *A* and *C* together. The lever *D* is permanently hinged to the assembling bench.

The driving disks are thirteen in number, six of steel and seven of raybestos, shown separately at *E* and *F* respectively. Part *G*, which is the same as part *A*, is cut upon its inner face as an internal gear and the raybestos disks are cut as external gears to match, the diameters being so calculated that the disks will enter part *G* and slide freely endwise but without appreciable shake. As part *G* is bolted directly to the flywheel of the engine, these disks are thus positively driven.

The steel disks *E* are cut as internal gears to fit in the same way over the teeth of part *H*. The complete driven member *I* is made up of parts *H*, *J* and *K*, the latter being disks of heavy sheet fabric resembling rubber packing which are riveted to the three-lobed spider *J* and later bolted to part *H*, thus forming a single flexible unit. When assembled, the steel disks become a part of this unit, as the raybestos disks are of the driving member.

All of the toothed parts are cut upon the Fellows gear shaper. As the cutting of an internal gear of the nature of part *G* necessitates an annular recess at the inner end of the ring as a run-out for the cutter, the first raybestos disk is without teeth and is riveted to the inner face of the shell. The steel and raybestos disks are then put in alternately until all are in place.

Holding Up the Inspector's Hands

By O. C. Richards

In many shops, the inspector is expected by the rank and file to catch all mistakes anyone may make, and be the goat any time that a piece of bad work gets out of the department. I have often heard remarks to that effect from both workman and foreman. It is not uncommon to hear, "Well, I think that is good enough. I have put out this kind of a job before and it passed the inspector."

It is not hard to see what the effect of such an attitude will be on the morale of the producers. One result will be that a larger force of inspectors will be needed to handle the large volume of detail. The inspection department will indeed have a hard row to hoe. Where spot checking was perfectly satisfactory, when the workmen realized their responsibility, a 100 per cent inspection will often be required to insure the quality of the work leaving the department when they do not realize it.

The only excuse for the need of inspection is the fact that neither foreman nor workman is found 100 per cent perfect in ability and effort. Wherever there is a marked feeling of dependence on the inspector, it is very evident that workmen will become careless. There is entirely too little attention given by the average foreman to instruction along this line. In fact, I have actually heard the inspection department criticised by a foreman in the presence of the workmen.

I have had the idea of personal responsibility impressed upon me in a very forcible manner. The management of a firm for which I once worked laid a great deal of stress on this point, and I will always be grateful for the deep impression left on me personally. During the late business depression, the inspectors were entirely removed from the department of which I was foreman, and I am sure that I will be borne out in the assertion that there was absolutely no let-down in quality.

I consider a good inspector a great help to a foreman, and am sure that the foreman will find many chances to assist the inspector in becoming more valuable. I have several times taken an inexperienced inspector in hand and spent a considerable amount of time instructing him as to points to watch, and why certain inaccuracies will make trouble later on. I have found such time well spent and have always received thanks from the inspection foreman. Of course, considerable diplomacy is needed, as the foreman can act in an advisory way only and will soon come to grief if he attempts to exceed his authority.

If the workman will be thoroughly honest and give his best efforts and his most careful thought, he will not accept parts that are not in good condition and will not pass out of his hands anything that he does not know is all right. Of course there may be, occasionally, defects that are not obvious without very careful gaging or checking to drawings to which the workman does not have access. It is not reasonable to expect perfection, but I am confident that systematic propaganda of the idea of "Holding up the inspector's hands" will result in a very substantial improvement in quality.

Draftsmen and Their Chances for Promotion

By G. M. EATON
Chief Mechanical Engineer,
Westinghouse Electric & Manufacturing Co.

Men who have risen from the drawing board—Why some draftsmen do not rise—A few maxims and a lot of good advice

AFTER READING the article entitled "The Disease Called Drafting—Discussion," by Elam Whitney, on page 960, Vol. 57, of the *American Machinist*, it is my opinion that the title would more accurately describe the article it heads, if the punctuation were altered to make it read, "The Disease Called 'Drafting Discussion.'"

I am a draftsman and proud of it. I admit that I am a good draftsman. True, I no longer work at the profession steadily, but many a night at home I dig out structures on the drawing board that I can arrive at in no other way.

From the standpoint, then, of a man who respects the profession of draftsman, I wish to ask Mr. Whitney whether his experience does not show shining examples of promotion from the drafting room. He has painted a picture of unmitigated gloom, tending to dampen the ambition and discourage the initiative of the "poor devil of a draftsman."

Let's look at the other side of the shield.

I am well acquainted with a large industrial organization where the men now occupying the positions of Vice President, Director of Engineering, and Chief Engineer, all started as draftsmen. In the Westinghouse Electric and Manufacturing Co., with which I have the honor of being connected, a large number of men have risen to very responsible positions from the drawing board.

Men Who Have Risen

The present manager of one of our subsidiary companies was once a draftsman with the parent company. Some of the most important phases of our engineering work are directed by men to whom their experience at the drawing board is of priceless value.

The fact that great men have been through the mill does not mean that the drawing board is an ideal permanent roost for able men, and this leads to the statement of a creed that is radically different from Mr. Whitney's proposed cure. If I read his article correctly, he is searching for some magic method by which the ablest men can be broadened, and kept happy, working on the board until they reach the retiring age limit. The quest of Ponce de Leon for the "Fountain of youth" was just as hopeful and logical as this will-o-the-wisp.

This is, perhaps, the logical place to dissect the fundamental reasons for the stagnation of some draftsmen.

Some employers seem to view a new drafting recruit as in the same class as a bar of 40-50 carbon steel. The steel is cut off, trimmed, machined to the desired shape and size, and is then given a heat treatment and a bit of superficial polish to keep it in precise *statu quo* for the permanent fulfillment of some definitely prescribed function. The draftsman is supposed by such employers to learn the system and practice of the plant and to become adept in matching requirements against facilities, and then stick right there till he drops in his tracks. Fortunately, this misconception is not universal on the part of employers.

Too many draftsmen assume Mr. Whitney's pessimistic attitude and abandon or never start determined effort to grow.

After some thirty years of observing this problem of drafting development, I have pegged up some fixed conclusions.

First—Regardless of how such discouraging conditions as today face the draftsman may have started, the first move for an improved condition lies with the draftsman as an individual.

I hear some brother draftsman start to deliver a pretty smooth-sounding line of talk to prove that he is the victim of circumstance. Pardon me, brother, if I interrupt. The very rounded smoothness of your flowing periods, proves that you have committed your speech to memory and have hypnotized yourself into believing it is a correct picture of the facts. Frankly, I am from Missouri.

If you like mottoes, pin this one up where you can see it: "Opportunity has no age nor date. It has conditions and circumstances. He who fulfils the conditions and conquers the circumstances has a sure future." Then peg a short one up alongside: "If you must kill time, try working it to death." There is the law and the prophets for draftsmen and all other men.

A Draftsman's Secret of Success

The best draftsman I ever met was asked the secret of his success by a new addition to the force. He said, "Keep the business end of your pencil on the paper, and keep it moving." But he remained a draftsman many many years. He should have added a list of other things like this:

Study in correspondence or night schools; read technical literature; then, as you grow, write articles for the *American Machinist* and other technical papers.

If you are so fortunate as to live in a city like Pittsburgh, attend engineering meetings; for example, the Engineers' Society of Western Pennsylvania, the A.S.M.E., the A.I.E.E. Find which fits you best and join as a junior member. Find work to do in the society of your choice; possibly you will be given undesirable work at first, but do it well. There is always plenty to do and it is an opportunity if you can only realize it.

This work among live engineers will serve to broaden your point of view and will fit you to fill one of the openings in the organization where you are employed.

Mr. Whitney hits the nail on the head in his reference to the narrowing tendency of continued and exclusive application of effort over the drawing board. The man of the future who is now at the board must watch perpetually to head this off, and close contact with men of present achievement in the engineering societies is the best safeguard. The leaders in all industries are continually sifting their forces to find men of caliber big enough to fill existing gaps. It is up to you to broaden so that you will be successively singled out by the meshes of larger and larger screens.

Work Is Fun, Not Drudgery

Do I hear you say this means a deuce of a lot of work and mighty little fun? Get this fact digested and assimilated into your bones: If you are the kind of red-blooded man that is worth building, you will find that in carving out a career "Work is fun."

The second tenet of my creed is this: The most corrosive influence among draftsmen is the Bolshevik draftsman who sees his employer as his enemy and who spreads a negative gospel of gloom, discontent, and disloyalty. The man who lends a willing ear to the chronic sorehead is a close second. The men who are going to rise to prominence via the drafting route will avoid the grouch as the plague, and will pound away with single-minded persistence on rising from the actual making of drawings to the direction of such work and to still more difficult undertakings.

The very fact that there are some discouragements in the path of draftsmen is a definite key to the door of opportunity for men of spine who can carve a way through for themselves. Anybody can successfully buck an easy game, but it takes a real man to overcome real obstacles.

There will always be men who are better fitted by natural talents for drafting than for any other line of endeavor, and every large force will contain a sprinkling of older men. I am positive that a goodly proportion of these men could today be more valuable to themselves and their employers had they started early to follow the preceding suggestions.

Success the Result of Earnest Effort

I concur fully in the contact with the shop which Mr. Whitney advocates, though I prefer the method which I followed for years in my early life as a draftsman in the Union Iron Works in San Francisco. I went to work an hour early every day and spent that hour becoming thoroughly posted on every operation involved in building machines which I designed. This involved co-operation at home, and the Lord help the young man who does not receive this vital aid in his career. He will certainly need outside aid.

There are apparent difficulties in the administration of drafting forces, where men enter, learn, grow, and pass on, but these difficulties are not real. We have to choose between a turnover where the outgoing talent and experience is lost to the organization, and a turnover where this is all retained and the organization thus built up of men who know the problems and reactions of draftsmen from personal experience.

The draftsman who lies comatose under the tree of opportunity with his mouth agape, awaiting the chance dropping of a plum down his gullet will finally be buried right there. The plums are for the man who laboriously shins up and shakes the tree.

In any live organization, the man who does this wisely will be met more than half way.

The Machine Shop Foreman's Salary

By F. P. Terry
Belfast, Ireland.

The small salary—or should we say wage—of the machine shop foreman is often commented upon when foremen gather together, and is even more often throught about and brooded over when they are alone. A proper recognition, as well in other ways as in salary, to keep pace with the growth of their responsibilities has not been given these men, for, in some cases known to me, foremen in charge of two or three hundred men do not receive as much remuneration as some others who have only twenty or so to look after.

This state of affairs has existed since long before the war. When considering war bonuses and the like the poor foremen, as usual, came off very bádly, many receiving less than some of the unskilled operators, who got piecework rates and who were protected on one side by the labor unions and on the other by a kind-hearted government. In many cases the foremen were informed that the reason for the smallness of their advance was that it was to be permanent, and not subject to reduction after the war. Such promises have been broken long ago and in some cases these foremen have been given the alternative of accepting substantial cuts or being dismissed.

It has many times been said that the foreman gets what he is worth and that employers are prone to take him at his own valuation. While this may be true in some cases it does not cover all, and I am afraid that there are in this country a good many unemployed foremen who have refused to give their services in return for inadequate remuneration, while many others have been compelled to take inferior positions in order to keep the wolf from the door.

These men have seen their positions filled by a class that is prepared to accept anything that offers in the way of salary, with the intent to make up the deficiency by means of secret commissions on supplies and doles from workmen for the privilege of being kept in employment.

Of course it is difficult to get the employers, especially the ones that believe in small wages, to accept this point of view. It would, however, be well worth their while to study the conditions, for it is more than likely they would discover that what they save by their niggardly policy toward their foremen is far outweighed by the losses due to lessened output and higher production costs.

A capable and reliable foreman is a good investment, however small the shop, and if a shop is going to have a foreman at all it is far better to have one whose qualifications are such as to command a good salary than to have a less efficient man whose shortcomings will cost the employer much more than the amount necessary to secure the services of the better man.

There should be a good foreman in every machine shop. He should be capable of designing jigs and fixtures, for, even though a regular designer is employed,

the foreman's advice and friendly criticisms are worth all they cost. He should also be able to select equipment when necessary. He should possess the experience and tact in handling men that will enable him faithfully to represent his employer to the workmen and, what is of equal importance, the workmen to his employer.

Such a man will always keep things moving forward. He is not concerned with the saying: "What we have done before has worked well; why change it?" His motto is: "Can it be done better?" A firm that expects to retain such a foreman at a small wage is doomed to disappointment, for under such condition the best of men will soon reach the stage of inquiring of himself, "What's the use?" and will either settle into apathy or go elsewhere.

There is another scare commonly put up to keep down the foreman's remuneration. Some employers profess to believe that a good salary tends to develop a swelled head. There is an old saying that gives answer to this: "Brains do not swell, but the head that lacks them." A certain amount of pride is, after all, desirable.

There are employers who believe in adequate salaries for their men, among them the late Lord Northcliffe, of whom it is said that he often doubled a man's salary in the course of a friendly chat. A similar policy might well be adopted in many of our machine shops, for it certainly could have no worse effect than the present attitude, which, as a Glasgow foreman said to me a few days ago, is "fast makin' us the fines' bolshies in the warld".

Proposed Wire and Sheet Metal Gages

A SUB-COMMITTEE of the National Screw Thread Commission has been at work for over a year on a standardized system of wire and sheet-metal gages eliminating many sizes and have agreed tentatively upon the following. These are for the criticism of all users of such gages. Criticisms should be sent to us or to E. C. Peck, General Superintendent, Cleveland Twist Drill Co., Cleveland, Ohio.

Group No. 1 In.	Group No. 2 In.	Group No. 3 In.	Group No. 4 In.	Group No. 5 In.
0.001	0.012	0.033	0.064	0.105
0.002	0.014	0.036	0.068	0.110
0.003	0.016	0.039	0.072	0.115
0.004	0.018	0.042	0.076	0.120
0.005	0.020	0.045	0.080	0.125
0.006	0.022	0.048	0.084	0.130
0.007	0.024	0.051	0.088	0.135
0.008	0.026	0.054	0.092	0.140
0.009	0.028	0.057	0.096	0.145
0.010	0.030	0.060	0.100	0.150

Group No. 6 In.	Group No. 7 In.	Group No. 8 In.	Group No. 9 In.	Group No. 10 In.
0.156	0.217	0.288	0.369	0.460
0.162	0.224	0.296	0.378	0.470
0.168	0.231	0.304	0.387	0.480
0.174	0.238	0.312	0.396	0.490
0.180	0.245	0.320	0.405	0.500
0.186	0.252	0.328	0.414	0.510
0.192	0.259	0.336	0.423	0.520
0.198	0.266	0.344	0.432	0.530
0.204	0.273	0.352	0.441	0.540
0.210	0.280	0.360	0.450	0.550

It should be noted that size No. 1 is 0.001 in.; size No. 18 is 0.018 in.; size No. 51 is 0.051 in.

In studying this subject the committee found there were 26 systems in more or less use. The total number of sizes in the various systems up to 0.550 in. is 1,226.

It will be noted that the proposed standard contains 10 groups of sizes. The variation in each group is by arithmetical progression. It has been found that group No. 1 with a minus tolerance of 0.0002 in. will take in 86 sizes of the 26 systems; group 2 with a minus tolerance, 0.0003 in., will take in 126 sizes of the 26 systems.

Allowing a minus tolerance of 0.0005 in. on all the rest of the groups:

No. 3 will take in 63 sizes
No. 4 will take in 41 sizes
No. 5 will take in 32 sizes
No. 6 will take in 16 sizes
No. 7 will take in 15 sizes
No. 8 will take in 2 sizes
No. 9 will take in 3 sizes
No. 10 will take in 8 sizes

This makes a total of 392 sizes or 32 per cent of the whole.

If we should consider that the accuracy of measurement will vary by either plus or minus one-tenth of a thousandth then the proposed table will take in 428 sizes, or 35 per cent of the total list. If accuracy is not required closer than plus or minus five-tenths of a thousandth then there will be 547 sizes, or 44.7 per cent included in the proposed tables.

What's Wrong with the Railroad Shops? —Discussion

BY JOHN MARK MAY

I have read the recent articles in the *American Machinist* entitled "What's Wrong With the Railroad Shops?" with much interest because in them there is a volume of facts that many who have been connected with both railroad and other shops know, even though for various reasons they have not sought to put them in print. There ought and I believe there will come a lot of good to the railroad shops from the study of these articles.

There does seem to me, however, to be one point that has not been touched upon which is a burden to the railroads in general, probably to a greater extent than in any other class of shops. It is the lack of loyalty that the employees have for their employers.

LOYALTY ON RAILROADS

The discipline on the railroads is more strict generally and perhaps that is one reason for lack of loyalty. However, my experience as a railroad employee for about seven years in office duties, train service, and shop work with two of the large railroads in the Eastern part of the United States, when compared with a like service with some of the large manufacturing concerns in the same locality, leads me to believe that there is a decided difference in this important matter—loyalty.

On the railroads each individual, and each department, had less regard for other individuals, and for other departments, and seemingly gave less thought about the organization as a whole than did those in the manufacturing concerns.

This matter of loyalty is bound to affect production in both quality and quantity and I believe is one of the problems that the railroad shop must find a way to solve. It would be interesting and helpful to hear from others who may have had experience in both kinds of shops.

TABLE XXIII

Australia—Imports of Machine Tools

Country of Origin	1909 £	1910 £	1911 £	1912 £	*1913 £	1914–15 £	1915–16 £	1916–17 £	1917–18 £	1918–19 £	1919–20 £	1920–21 £
United Kingdom	22,747	39,318	66,259	80,932	78,276	48,124	64,106	85,958	41,840	179,471	262,761	849,189
Canada	.....	10	40	376	99	107	1,671	184	395	1,260	353	1,277
New Zealand	90	316	170	62	.....	66	9	761	665	551	114	29
British India	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	383	.....
Other British Possessions	10	8	56	199	25	11	.....	53	4	.....	.....	444
Austria-Hungary	1,034	.....	.....	259	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	325	132	24	121	476	209	.....	.....	.....	.....	.....	.....
France	1,728	2,107	2,385	3,452	1,993	837	243	507	.....	2,728	1,905	7,561
Germany	4,330	6,818	11,004	16,627	10,933	2,890	178	.....	.....	.....	.....	.....
Italy	4	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Netherlands	689	922	.....	.....	.....	.....	.....	.....	.....	.....	.....	248
Sweden	51	288	1,369	913	858	1,531	791	398	.....	747	2,048	19,624
Switzerland	18	280	336	136	.....	.....	.....	665	.....	.....	67	5,999
Norway	.....	.....	.....	.....	.....	.....	.....	220	.....	.....	.....	.....
Denmark	.....	.....	163	226	188	.....	125	.....	.....	.....	.....	713
Russia	.....	188	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States of America	16,317	25,331	45,514	55,106	55,407	52,449	75,800	85,565	55,997	115,577	178,131	534,016
Hawaiian Islands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	82
Other Foreign Countries	.....	33	139	7	45	27	78	27	258	42	.....	236
Share of Importing States												
New South Wales	17,503	29,428	56,780	75,348	80,831	59,600	79,994	93,579	44,198	96,033	179,818	551,964
Victoria	21,079	29,168	48,893	55,589	41,524	32,264	52,517	64,419	45,720	188,282	220,908	610,861
Queensland	2,295	5,084	7,333	14,022	13,292	8,519	5,540	7,929	4,206	7,589	20,564	47,420
South Australia	4,566	7,551	10,490	8,976	5,693	2,536	2,938	6,784	3,928	7,209	19,922	50,081
Western Australia	1,225	4,381	3,837	3,659	4,659	2,814	1,822	1,462	978	462	2,742	14,849
Tasmania	675	139	128	822	2,301	408	190	1,166	125	801	1,808	144,243
Northern Territory	.....	.....	.....	.....	.....	110	.....	.....	4	.....	.....	.....
Total of Imports	47,343	75,751	127,461	158,416	148,300	106,251	143,001	175,339	99,159	300,376	445,762	1,419,418

*Period 1909 to 1913 inclusive, is covered by calendar years.
Period 1914–15 to 1920–21 inclusive, is covered by fiscal years, beginning July 1st and ending June 30th.

TABLE XXIV

Philippine Islands—Imports of Metal Working Machinery

Country of Origin	1911 $	1912 $	1913 Pesos	1914 Pesos	1915 Pesos	1916 Pesos	1917 Pesos	1918 Pesos	1919 Pesos	1920 Pesos
United States	6,670	1,555	30,696	39,672	30,391	37,277	2,861	36,184	121,397	185,356
United Kingdom	2,499	3,184	48,348	4,286	349	114	.....	.....	43	4,449
Hongkong	139	.....	.....	.....	475	.....	.....	.....	.....	.....
Belgium	.....	.....	24	.....	.....	.....	.....	.....	.....	.....
France	.....	.....	278	.....	.....	.....	.....	.....	.....	.....
Germany	.....	.....	122	294	.....	.....	.....	.....	.....	1,290
Hawaii	.....	.....	.....	.....	.....	.....	480	.....	.....	.....
Total of Imports	9,308	4,739	79,468	44,252	31,215	37,391	3,341	36,184	121,440	191,095

Value of Gold Peso is 50c.

When Poor Work Can Be Excused

By O. B. Jones

Executives in the machine shop are often uncertain regarding the hiring of help, often fighting shy of the men not thoroughly experienced; but it is important not to deprive oneself of such employees who will later develop into very good mechanics. Too often stress is laid on experience, overlooking at the same time the quality of sincerity that employees should possess. As one foresighted superintendent observed, "Give me the sincere man every time, even though he lacks experience, in preference to the chap who has experience but is not exerting his best."

There is a good deal warranting thought in what this superintendent says. And in this connection it should prove interesting to quote the foreman of one machine shop who had been experimenting with help to a considerable extent. He insisted: "What I demand first of all, is that an applicant be interested in the work he undertakes. That is essential. I don't care a hoot whether he is or is not an A-1 mechanic. With sincerity and interest he can improve his position, and that is what we all want, a man to grow in experience as he goes along—no backsliders by intent."

No backsliders by intent! Here it may be said that this foreman did not countenance any slipshod work *when the operator could do better*. He knew his men and their abilities. The man under him who had attained proficiency could not put through questionable work because he happened to be on a piece basis. The only time that this foreman condoned poor work was when the employee was inexperienced, but sincere in doing his best. That is a rule by which more executives in the machine shop should govern themselves.

The Old Man without a Trade

By O. C. Richards

There is a certain class of men that we are wont to think of as past their usefulness and of very little consequence in our shops. In this class is the old man who has never learned a trade or who has become physically unable to continue in his accustomed vocation. He may have been a salesman or he may have followed one of many occupations. Perhaps he has been only mediocre, possibly he has had a small business of his own which has not prospered. Usually his strength is limited, but he is willing to work and must find some way of earning a living during his declining years. I believe that we have room for many such men in the ordinary shop and should be glad to get them.

A man of this description often finds a place as toolcrib attendant. I have in mind a man who was a traveling salesman for many years, and who was obliged to quit the road due to advancing age and the effort required to keep the pace set by younger men. He made an excellent man to care for the toolcrib and thus found something that he could do, and do well, without taxing his strength. Another man had, in his younger days, been a freight handler and warehouse man. As he came to advancing years he found that he was unable to do such work on account of the heavy labor involved. He secured a place as toolcrib man and filled it very satisfactorily. Stockroom clerks, where the materials are not such as to involve heavy manual labor, can well be recruited from this class.

One shop does not employ colored porters and sweepers. The sweepers are mostly just such men as we are discussing, having usually been laborers during their active years. Wherever men are needed to supply material to productive workers and to do the little odd jobs necessary to keep a steady flow of production, the old man is of decided value. In an assembly department, of which I was once foreman, one job consisted in operating a small power shear and keeping the workmen supplied with insulating materials, much of which could not be ordered in advance. An interruption to this job meant a real loss of production, consequently it was very annoying to have to break in a new man. Several times a younger man was employed for this job, with the result that in a few weeks he was asking for work where he could learn something of value and advance himself. We then secured an ex-bookkeeper who had lost his position through his inability to keep up with the march of progress. There was no more trouble with labor turnover in this case.

Most of the jobs that we have been discussing hold out little opportunity for advancement and teach little that would be of value in another line. Consequently, the man without ambition will be most satisfactory. When a man has reached old age he is not apt to be looking very far into the future and will be satisfied with a chance to make a living, if the surroundings are anything like pleasant. His attention is not distracted easily from his work, and he is usually faithful and conscientious in the performance of his duty. He is very apt to magnify the importance of his responsibilities and will make great effort to show his efficiency.

A Superintendent Who Bought Experience

By Frank V. Faulhaber

There are different means of attaining a superintendency in the machine shop, but there is one young man who followed a course out of the ordinary over three months ago at this writing, and who up to this time is holding his coveted position.

This man had been in charge of various departments in different machine shops, but his experience did not embrace that required in the large plant which required a new superintendent. It might here be said that the man tried a little bluff, and it was this move that brought him the offer of the position. But his inexperience perplexed him. Yet, there was the opportunity, an opportunity to hold sway as superintendent. What did he do?

The aspiring young man visited another large machine plant, operating under somewhat the same conditions as the one of which he was to take charge. He explained his problem, frankly confessing his inexperience, and offering to pay so much per hour if some of the more important operations in the tool shop were pointed out in detail. It was on such matters that he was uncertain; but the few hours that he put in obtaining solid information provided the confidence to assume charge of his new duties. And the interesting part of the whole proceeding is that he has already earned a salary increase, having been engaged at a modest stipend. This example only goes to point out that where there's a will to succeed in the machine business, there is more than one way.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Balancing Crankshafts in the Chalmers Plant

By Frank C. Hudson

The Chalmers Motor Car Co. has an interesting method of balancing its 6-throw crankshaft, which differs considerably from that usually employed. The first step is to secure a standing or static balance on parallel ways, as shown in Fig. 1. Weights of various sizes are

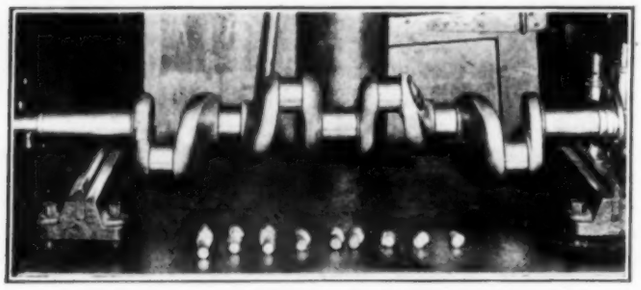


FIG. 1—SECURING A STATIC BALANCE

provided, and are attached to the crankshaft temporarily by a sort of adhesive mixture of about the consistency of putty. Placing the crankshaft on the ways, as shown, its static balance is secured by attaching the required weight at the proper point until it will remain stationary in any position. The necessary amount is then removed from the proper point of the crankshaft to secure a perfect balance. Fig. 2 at *A*, shows where metal has been removed by grinding.

The dynamic or running balance is secured in the swinging balancing frame shown in Fig. 2. The crankshaft is supported by its three bearings in arms which

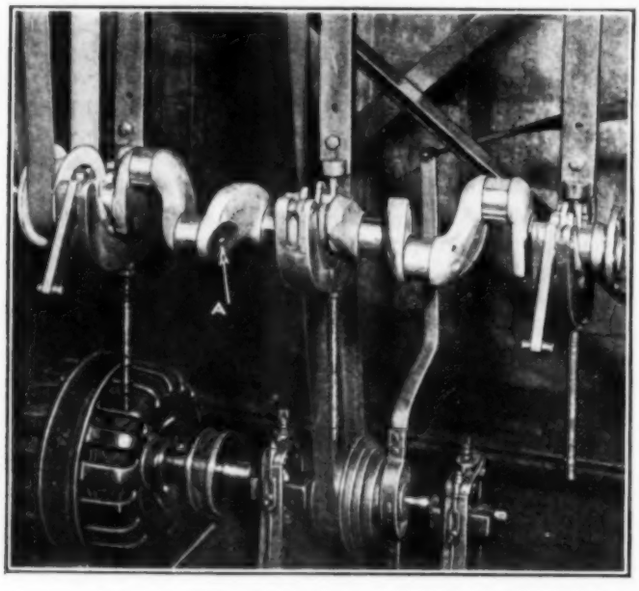


FIG. 2—THE METHOD OF SECURING A RUNNING BALANCE

are free to move should the crankshaft be out of balance. A pulley at the end of the shaft, as shown at *B*, rotates the crankshaft at the desired speed. Unless the shaft is in perfect balance, the arms oscillate and the heavy side is noted.

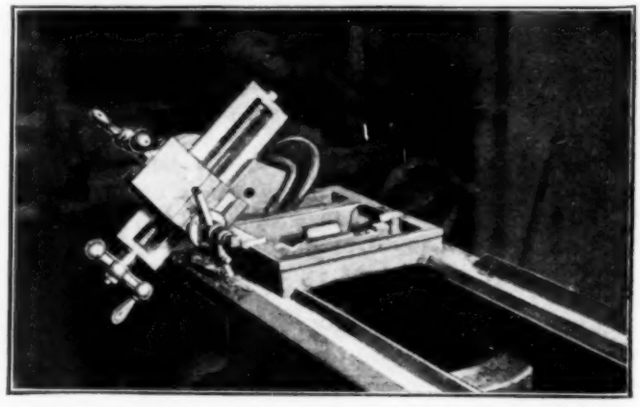
A further removal of weight by drilling or grinding places the crankshaft in proper running balance, in order to secure a quiet running engine. Varying weights are fastened to the crank pins, as shown, to secure a perfect running balance and to show where the metal is to be removed. The operators become very skillful, and the work is handled more rapidly than seems possible to one not accustomed to it.

Replaning a Lathe Bed Without a Planer

By William C. Pope

The accompanying photograph shows the manner in which I replaned the shears of two old lathes that had been badly worn in the work of rough-turning 75-mm. shells during the war. As the tailstock had been moved very seldom during this period of severe service, the inner ways were scarcely worn at all while the outer ones were in bad condition. There was no planer within a hundred miles of our shop that was large enough or accurate enough to do the work.

In the shop I found an old slide rest, and this I clamped to the base of the tailstock with a heavy



REPLANING A LATHE BED WITH IMPROVISED TOOLS

C-clamp, carefully setting the slide to the required angle. Oiling the inside ways with thin oil, I was able to do a very satisfactory job by pushing this miniature planer back and forth by hand, withdrawing the tool at each return movement, as there was no clapper box to relieve the point. I took three cuts over both of the outside ways, removing about $\frac{3}{64}$ in. of metal in all; time, 7½ hours. The second lathe was in much worse condition and I was obliged to work very carefully, but I had a fairly acceptable job in about two days.

Of course a lathe reclaimed in this manner is not going to become a tool room pet, but there are many

lathes that have been used as these had been, especially in the war time, that can be repaired and made serviceable in the same way, and will be perfectly good lathes for the ordinary repair shop.

Don't get the idea that one's tongue is going to hang out from pushing this improvised planer back and forth long enough to do the job for it runs a good deal easier than would be expected.

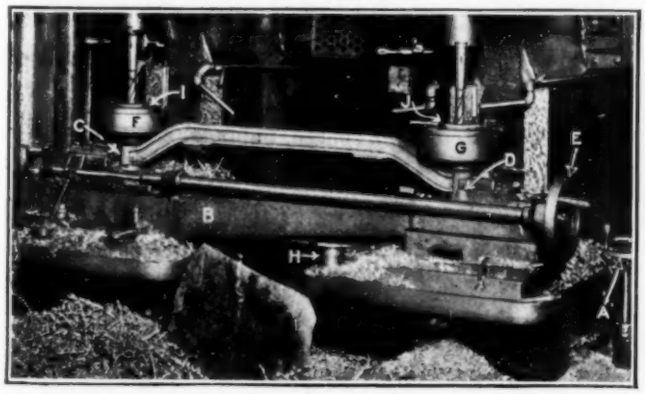
Drilling a Front Axle

By I. B. Rich

The illustration shows the Pierce Arrow method of drilling front axles which has a number of interesting features. Two Colburn heavy duty drilling machines are mounted on a substantial base plate, forming what is practically a two-spindle machine. The position of the right hand machine can be adjusted by the hand wheel *A*, should this be necessary. The fixture consists of a substantial base *B*, which is clamped to both tables and carries the centering and clamping jaws *C* and *D*. Jaw *D* is fixed but *C* is adjusted by means of a screw controlled by the hand wheel *E*.

The drill bushings are supported in the arms *F* and *G*, which are attached to the back of the fixture body. As can be seen, the arms are very substantial and carry drill bushings such as shown at *H*. These bushings are easily and quickly locked in position by the plates *I* and *J*. After the drills have been well started, the bushings are removed.

The drills are kept well lubricated and cooled by means of lubricant delivered through the pipes shown.



AN AXLE DRILLING METHOD

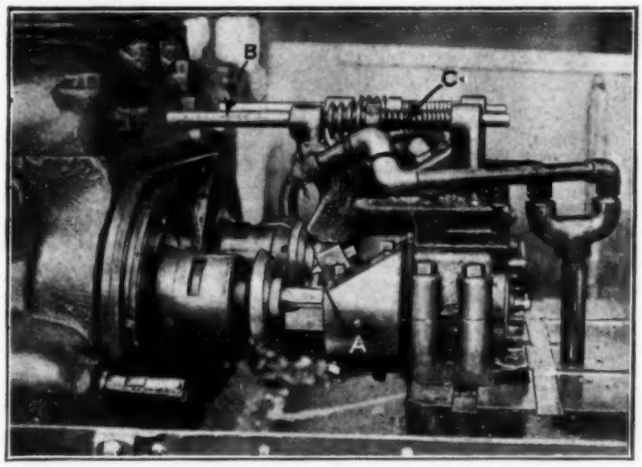
The diameter of the drills is 1⅞ in. and they run at 182 r.p.m. with a feed of 0.013 in. per revolution. Other drilling speeds and feeds in this shop are: Pivot axle: 2¼ in. diameter drill, speed 123 r.p.m., feed 0.013 in. per revolution. Pivot 1⅜-in. drill, speed 172 r.p.m., feed 0.010 in. per revolution.

Double Spindle Work on Differential Gears

By H. E. Crawford

A method of turning Nash differential bevel gears is illustrated herewith, a Jones & Lamson double-spindle flat-turret lathe being used. The gear is pressed on a mandrel which is chucked in the front spindle. After one side has been finished the mandrel is reversed and chucked in the rear spindle to finish the opposite side. As the two pieces are in process simultaneously, one piece is finished with each complete operation.

The necking operation is done by means of the tool *A*, which is held on the end of a shaft and has a rack cut in one side. A shaft with a circular rack cut on it, shown at *B*, is set so that when the turning operation is nearly completed, the shaft will strike a boss on the head of



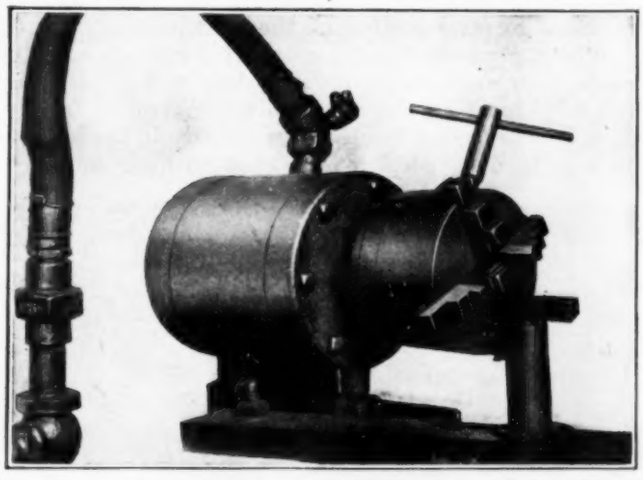
TOOLS FOR FACING AND NECKING GEARS

the machine. As the turret travels toward the head the shaft is pushed back. The circular rack engages a gear, which is also in mesh with the shaft on the rack that carries the tool, and as the shaft *B* is forced back, it turns the gear and forces the necking tool downward. When the operation is completed and the turret is withdrawn from the work, the spring *C* forces the shaft forward and holds the tool up. The gears are drop forged and the production is 19 per hour.

An Air Driven Chuck

By George Allen

We have found the air driven chuck shown very useful for filing round pieces, cleaning out bruised threads, light turning and all sorts of odd shop jobs that continually come up. It is also very useful for polishing many small parts that would take much longer otherwise. Of course a chuck like that couldn't be



AN AIR DRIVEN CHUCK

driven this way in a shop that didn't have compressed air, although it might be used on a small electric motor. In any case there are many shops that would find a device of this kind very useful.

Expanding Chuck for Large Bushings

By C. J. Priebe

In the plant of the Cincinnati Planer Co., Cincinnati, Ohio, lathes have been equipped with special expanding chuck attachments for holding bushings when turning the outside or facing them. The bushings must first be reamed or ground inside, which means, of course, that the expanding chuck attachment is suitable for second-operation work only.

Bushings having bores from 2 to 3½ in. in diameter can be held on the attachment fitted to a 16-in. Greaves-Klusman lathe, the back of the head of which is shown in Fig. 1. The expanding mandrel *A* carries the work *B*, the operation of the mandrel being controlled by the hand lever *C*. To show the arrangement of the parts of the device and their action, the detailed view in Fig. 2 is given. It should be noted that this view was made from the front instead of the rear of the machine.

A movement to the left of 1/16 in. of the rod in the center of the spindle, with consequent movement of the bushing *A* on its taper seat, causes the bushing to expand 0.010 in. in diameter. Bushings with outside diameters in all nominal sizes that are necessary to fit the works, must be supplied. Each bushing is slit in six places, with adjacent slits made from opposite ends.

The mechanism at the rear of the spindle should be noted particularly on account of the four ball thrust bearings that are employed. These bearings are required because there is considerable end thrust on members which are adjacent to stationary members and which rotate with the lathe spindle. The gear shown at *D* does not rotate with the spindle. It is a part of the control mechanism, and rotates only when the handle *C* is actuated for clamping or unclamping. It is mounted on a member having a square thread of ¼ in. pitch, that runs in a stationary nut *E*.

Rotation of the gear draws the bolt through the spindle, so as to expand the bushing *A*. The ball bearings enable easy and rapid movement. A pin fits in the nut *E* to prevent it from turning, and is secured to the plate mounted on top of the headstock cap. The sleeve *F*, however, rotates with the spindle and so covers the bearings as to keep out dirt. Other details can be obtained by examination of the drawing.

Where a number and variety of bushings must be made, such an attachment saves time as it fits the machine for handling the works with the greatest facility. It is only necessary for the operator to slip the bushing that is to be finished on the split bushing, move the lever to the clamping position and start the cut. When he has finished the cut, by merely shifting the lever to the unclamped position, the bushing can be slid off again. The lathe is, of course, applicable to other types of work as a standard machine.

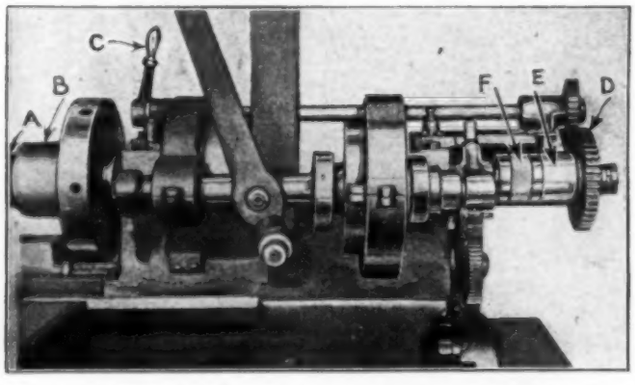


FIG. 1—EXPANDING CHUCK ATTACHMENT FOR HOLDING LARGE BUSHINGS

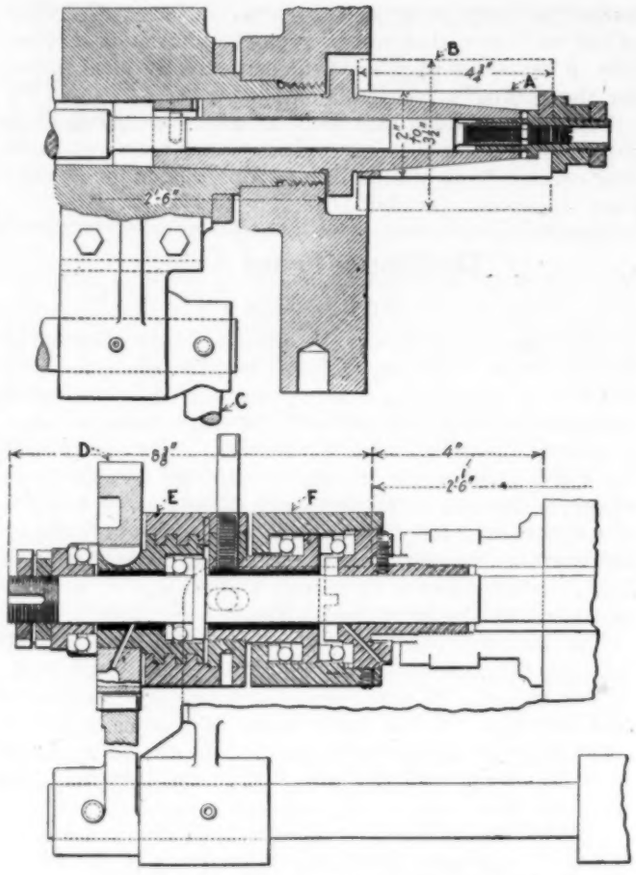


FIG. 2—DETAILS OF EXPANDING CHUCK ATTACHMENT

Choosing and Grinding Chisels—Discussion

By John N. Siousa

On page 811, Vol. 57 of *American Machinist*, under the above title, there is an article by G. A. Luers with whose conclusions I do not entirely agree.

For instance: the size and shape of a chisel should be determined by the work it is to do; also, it is desirable to use the proper sized hammer for the chisel. Should the chisel be a large one, the hammer should be in proportion, as it is quite well known that it requires a large percentage of the impact of a small hammer to affect the inertia of the chisel, whereas the greater part of the work done by the hammer should be directed to the shearing of the metal.

Hand hammers of various sizes should be swung in such a manner as to make little difference in the exertion on the part of the workman. He can use a large hand hammer with but little more effort than is required for a small one. The idea is to let the force of the hammer do the work of driving the chisel and let the workman swing the hammer, the handle being held loosely in the hand and allowed to rotate about a center near the little finger, together with a slight movement

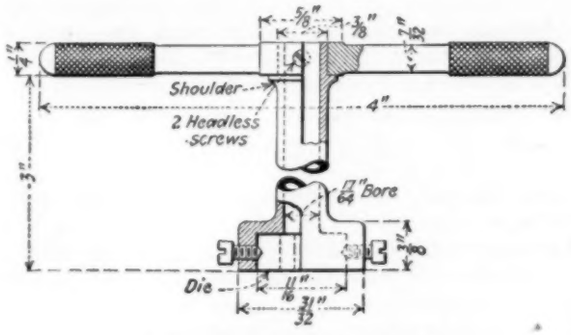
of the wrist and elbow. The main movement of the arm is from the shoulder.

The kind of material we wish to work determines the angle of the cutting edge for the chisel. If the material is soft, such as brass, the angle should be somewhat less than that used for metals of harder nature; as steel or manganese bronze. The form of the chisel edge should be slightly convexed in order to protect the corners, as the forces resisting the chisel should be directed toward the center of the blade to encourage compression. When the blade is concaved in form the corners are unprotected and are subjected to a bending stress. This is a bad condition and should be avoided.

A Tubular Die-Holder

By E. Lytton Brooks
London, England

The tubular die-holder shown in the accompanying sketch was made to run the threads "further down" on some U-shaped pieces upon which a regular die holder could not be used, and was afterwards found very useful around the shop for many other purposes, as for instance, the rethreading in place of studs that



A TUBULAR DIE HOLDER

had in some way become battered so that the nuts would not run on readily.

The holder is made from bar stock, the dimensions given being for a 1⅛-in. circular split die, but it may of course be made for any size that is required. The handle is made a driving fit on the shouldered end of the hollow shank and is further secured by two headless setscrews. The tool should be carbonized.

A Test of Rust Preventatives

By H. R. Fowler

Judging by the amount of rust preventative literature that comes through the mail, there must be about as much confusion in the minds of users as to the preventative best adapted to their work, as there is regarding water cutting solutions. About a year ago the writer started a comparative test on some of the samples sent in. To make the test more complete, we tried out also under identically the same conditions, ordinary machine oil, white lead and oil, kerosene, steam cylinder oil and even turpentine.

We took strips of black sheet iron and ground one side clean on a dry wheel. Then without touching the surface with the fingers, or even using a brush, one-half of each strip was covered with the protective coating, leaving the other half exposed. The strips were then fastened to a board and hung up out in the yard and left to their fate.

The test, which has just been concluded, ran for 12 months through a rather severe winter, a cold spring and a wet warm summer. In other words, we duplicated the conditions that a machine would be under if left on an open freight car for a long period, and the results are rather interesting.

The high point which stands out, is that the strip covered with cylinder oil was in the best possible condition, just as good as when put out. Regarding the commercial rust preventatives, the test seemed to show that they were all fairly satisfactory, except that the metal was slightly discolored. The only reason, therefore, for buying one as against the other would be price, convenience in applying or a persuasive salesman. The other oils, except for the cylinder oil, made a poor showing. The parts left unprotected were, of course, a mass of red rust. We have settled on the following plan for preventing rust on our work.

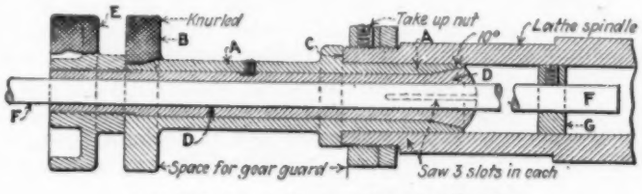
For work in process, or which is waiting in the inspection room, we use a light clear rust preventive oil, one easily wiped off if necessary by the inspector, and which will resist the acid thrown off by sweaty hands. For outside exposure, such as when shipping, we use the same stuff in heavier form, put on with a brush. But for stockroom use, the oil or the grease is objectionable, both because of the time required to put it on, and because it is disagreeable to handle. One of the rust preventatives which, in spite of the fact of its being very thin, stood the test well, can be used in a dipping tank at any temperature, no heat being required, and it quickly drys to a thin wax-like surface. It stands handling well, and yet is easily taken off with a little kerosene or gasoline. There are several concerns making similar products, all of which I believe to be good.

An Adjustable Gage to Go in the Lathe Spindle

By William T. Elzinga

Many times we have jobs that should be done on the screw machine but because of the lack of that useful piece of equipment we are obliged to do them in an engine lathe. Duplicate pins, bars, plugs, shafts, etc., of round square or hexagon stock are to be made to exact length and it is difficult to hold this measurement unless there is a gage or back-stop within the bore of the lathe spindle. The illustration shows a gage I have made for the purpose that requires no alterations to the lathe and which furnishes its own means of holding.

Part *A* has at one end, the knurled knob *B*, and at the other end is fitted to go into the bore at the rear end of the lathe spindle, which it enters up to the



BACK-STOP FOR LATHE SPINDLE

shoulder *C*. This end is split in three equi-distant places like a spring collet.

Part *D* is a spring collet and draw-bar combined, the split end of which is fitted to a 10 deg. taper bored inner end of part *A*, while in the other direction it extends entirely through *A* and the exposed end is threaded for the knurled nut *E*, by means of which the collet is tightened.

The gage-rod *F* fits the bore of the collet *D*, and is long enough to project beyond the outer end of the device so that it may be grasped by the operator's fingers for adjusting. A loose collar *G* is held to rod *F*, by means of a headless setscrew and serves to hold the rod central in the bore of the spindle. If a smaller gage-rod is desired it may be tapped into the end of the larger one.

When the gage-rod has been adjusted to the desired length the knob *B*, is grasped by one hand while with the other the operator sets up the knurled nut *E* and thus grips the rod *F* by means of the collet end of *D*, while at the same time the latter expands the shoulder of *A*, within the bore of the spindle and holds all parts in place. No wrenches are needed.

The extra long space between shoulder *C* and knob *B*, is so that the device will clear the gear guard of the lathe and bring the operating knobs in a position where they can be manipulated without difficulty.

There is a similar device on the market known as the Moor lathe attachment, the invention of E. Moor of San Francisco. This device requires the cutting away of a part of the take-up nut on the rear end of the lathe spindle in order to install it. My gage was inspired by the sight of Mr. Moor's attachment and to him belongs the credit of its devising, but my device has the advantage in that it necessitates no alterations of, or additions to, the lathe whatever.

Valve Grinding; Continuous or Reciprocating—Discussion

By Sandy Copeland

In reference to the editorial comment appended to the article on valve grinding by H. R. Fowler, page 1006, Vol. 57, *American Machinist*, is there not another and better reason for what is there called the "reciprocating" movement than the one cited?

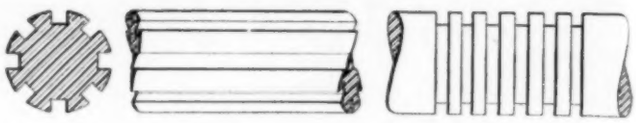
Automotive engines by no means have a monopoly of poppet valves. Such valves have been used upon steam engines, especially marine steam engines, for many years longer than I can remember, and if there is any kind of safety-valve other than a poppet used upon steam boilers I have yet to find it. Check-valves (except swinging checks) are also of the same type.

In my younger days my experience made me tolerably familiar with the machinery of steamboats and I have "ground in" many poppet valves. I do not remember ever having been told that the continuous rotation of such a valve during the process would cause it to become out of round, or that the partial turning, lifting and reversing, commonly practiced, would correct such a condition. I *do* know, however, both from experience and by reason of sulphurous adjuration by sundry capable and sometimes respected Chiefs, that the continuous turning will soon wear rings in both valve and seat.

The Fitting of Guide Screws and Half-Nuts

By J. T. Fowlson
London, England

On page 534, Vol. 57, of the *American Machinist*, A. L. De Leeuw comments in a most interesting manner upon the difficulties encountered in designing half-nuts for square threaded screws. Without presuming to criticize in any way the eminent author of the series of articles upon "Methods of Machine Tool Design,"



EXTREMES IN THE MATTER OF THREAD SECTIONS

I believe that sufficient emphasis has not been placed upon the reasons why such difficulty is experienced and that the cause should be brought out in a way that will enable the average worker to grasp the underlying principles.

There are many turners who cut square threads and fit half-nuts to them who do not know that, however careful they may be in preparing the cutting tool and in feeding it in exactly square with the axis of the work, the thread itself will not be parallel in section but will decrease in thickness as it approaches the core diameter of the screw.

Explaining the Sketch

To illustrate this let us refer to the sketch, in which two bars are shown, upon one of which is cut a series of grooves without lead while upon the other the grooves are laid parallel with the axis without helix angle. In the one case the standing parts between the grooves are parallel in section while in the other the diminution in thickness of wall as the cut approaches the core diameter is at its maximum. All threads cut with a square sectioned groove will present a condition somewhere between these extremes in proportion to the amount of helix, or lead.

I have seen turners, after cutting what they fondly believed to be a perfectly square sectioned thread, file and file upon the sides thereof, without in the least knowing why it was necessary for them to do so, in order to get the half-nuts to close on the screw in the required manner. The nuts could be *screwed* on the thread quite easily; but once on, the halves could not be separated.

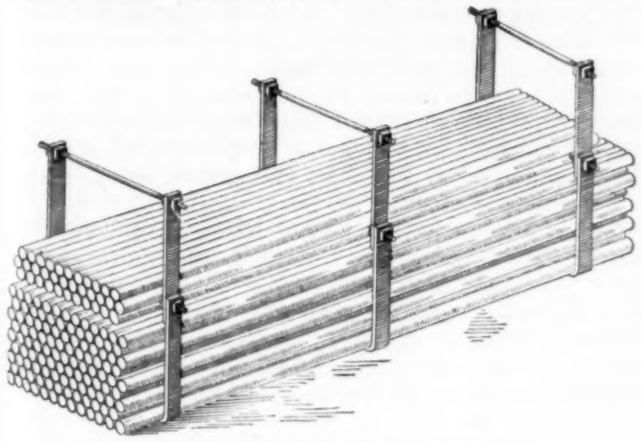
Marking, placed upon the thread for the purpose of showing the bearing spots, would indicate that the edges were "proud," and therefore there was apparently nothing to be done but to file them away. When a sufficient amount of metal had been removed to permit the half-nuts to close, the bearing that had at first existed between the screw and nut had been destroyed and such nuts would wear out very quickly.

As regards the beveling of the corners of the half-nuts, even upon Acme threads, the need is most pronounced. Having recently to make several Acme thread screws of 1¼ in. diameter, 1 in. lead, 4 starts, upon which half-nuts were to be fitted, a considerable portion of the meeting edges had to be cut away before the parts would mate; and the workman was unable to reason out the mystery until I had explained the foregoing to him.

Inexpensive Stock Rack For Small Shops

By John J. Borkenhagen

The sketch shows a simple and inexpensive stock rack for the small shop that possesses the advantages of being easy to set up, does not take up a lot of space when out of use and is capable of expansion to meet requirements. The material to be used in its construc-



STOCK RACK FOR SMALL SHOPS

tion is cold rolled steel ½x1½ in. in section, some ¾-in. round, and a few nuts. Three sections are required for each kind of stock to be racked.

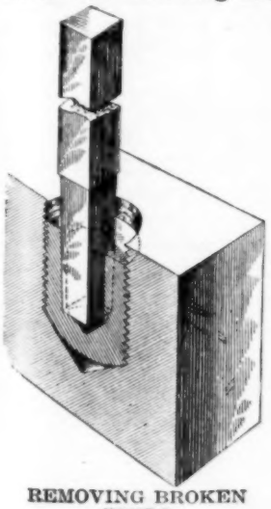
The longer flats are first drilled, about 1½ in. from each end, with ¾-in. clearance holes, and are then bent to form three sides of a rectangle. The shorter, straight pieces of the same stock are also drilled near each end with the same sized holes. The rounds are threaded at each end for nuts.

As each bottom section is filled, additional sections may be built up by adding two of the straight pieces and another rod. But one kind of stock should be kept in each rack and it is necessary to use the stock from the top downward, for if the lower sections were emptied first the weight of the stock in the upper sections would cause the lower ones to buckle.

Removing Broken Studs

By E. Lytton Brooks
London, England

The accompanying sketch shows a quick and simple method of removing broken studs or setscrews having either right or left hand threads. It is more efficacious and workmanlike than the three-cornered file stunt; the file having a nasty habit of splintering up or breaking off in the hole.



REMOVING BROKEN STUDS

A piece of square tool steel (conditions governing the length and size) is chosen and the square ground to a gradual taper toward one end. A hole is then drilled in the stud which will not quite admit the tapered end of the square steel. The square piece is then driven in tight and the stud can be unscrewed by the application of a wrench.

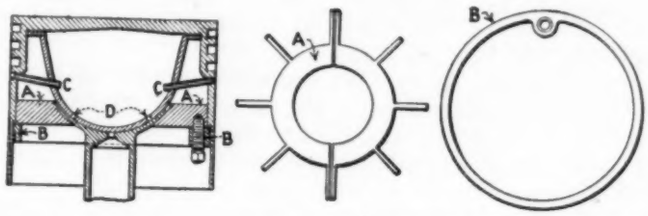
Ball Ended Connecting Rods

By Frank C. Hudson

Ever since the publication of a letter by J. C. Towlson on page 659, Vol. 57 of the *American Machinist* showing a ball connection between the upper end of the connecting rod and the piston in an internal combustion motor, there has been more or less discussion as to the advisability of such construction.

Some who have discussed the matter contend that it would be a decided improvement, while others feel that it would be much less desirable than using a piston pin. Some even go so far as to say that it would not work at all unless there was a spherical bearing on the crankpin end of the rod.

Just as an indication of the well known fact, that many devices which are very different from the usual existing practice are in daily use without being known



DETAILS OF PISTON FOR BALL END CONNECTING ROD

except to a comparatively few, I am sending an illustration of a connecting rod without a piston pin which has been in running for many years.

Engines in which rods of this type are used, were built in 1908 from the design of Herman Dock, inventor of the Rivett-Dock threading tool, and have been running successfully ever since. One is used as an electric light engine in a university in Japan, while another is still doing service in the State of New Jersey. So far as known neither one has given the slightest trouble.

The illustration shows the upper end of the hollow connecting rod very clearly, it being held in place against the hemispherical portion of the piston by means of a spider like flange *A*. The flange was made in two parts so as to be easily placed over the connecting rod. The arms of the spider fit inside the piston skirt as shown and the spider is held up against the connecting rod by means of the keeper or retaining ring *B*. This ring is threaded so as to secure fine adjustment and is locked in position by a tapered screw expanding a split keeper ring. The spider is of bronze but the keeper ring should be made of steel.

According to the designer, the construction shown gives about three times the projected area of bearing possible with a piston pin. The lubrication is excellent as oil flows through the small tubes *C* into the reservoir in the center, flowing from there through the two holes *D* to the upper or thrust surface of the connecting rod. The adjustment is very easy and the impact of the explosion is received directly on the bowl of the piston instead of through the piston wall. It was found that the piston had an almost continuous rotary movement in the cylinder and so tended to remain round. Another advantage of this construction is the ease of manufacture, as it is entirely a turret lathe job with no cross drilling to receive the piston pin. This design should be of interest to all who are following the discussion, particularly to those who claimed that such construction was not practical.

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KENNETH H. CONDIT AND FRED H. COLVIN
Editors
February 15, 1923

Let's Help Ourselves By Helping the Patent Office

THE weight of the Federated American Engineering Societies is behind Bill H.R. 8928, known as the Sterling-Lehlbach Bill for the Reclassification of Governmental Positions and Salaries. Just how effectively that weight will be applied depends upon how many engineers, as individuals, will write their Senators urging passage of the bill.

Manufacturers, as well as engineers, want this bill passed because it will raise the salaries of "Primary Examiners" in the Patent Office to $5,400, certainly not too much for the good men we must have in those positions.

The Sterling-Lehlbach Bill, after being passed by the House with some alteration, was reported, with its original provisions reinstated, by the Civil Service Committee of the Senate, and is now pending before a subcommittee of the Committee on Appropriations.

Everything might go all right if let alone, but there are risks. For example, Senator Smoot, chairman of the sub-committee, wants to substitute a bill of his own. To do so would introduce one delay that might be the forerunner of many others. So the Sterling-Lehlbach Bill should be gotten through now, while it is warm, and the way to get it through is to write to Senator Smoot and your own members of Congress asking them to do the job.

The Alien Deserves Help In Becoming a Citizen

WITH restrictions on immigration affecting the supply of labor as they do, the manufacturer will be well repaid for doing what he can to make life run smoothly for those of his men who are trying to become citizens of the United States.

In a recent letter to employers, the U. S. Department of Labor pointed out that "many aliens who really desire citizenship hesitate to take any steps in that direction because of lack of knowledge or natural timidity, but that this hesitancy disappears with friendly instruction and encouragement." In the same letter the Department refers to exorbitant fees frequently exacted by unscrupulous persons for the slight aid furnished aliens in making out and filing their naturalization papers.

Here is an opportunity to help three groups at slight expense and with little effort: First, the man who will become an American citizen; second, the Government; and third, yourself. There is in every plant someone who is qualified to help in this matter of citizenship without interfering with his other duties.

What Can We Learn From the Scrap Pile?

BOOKS could be written about the scrap pile. A probable reason why they are not is that nobody would read them. It would be too much like spending a summer vacation at a cemetery. And yet a casual visit to some cemeteries may furnish us a deal of interesting information. And so it is with the scrap heap. Here we cannot read the history of the deceased on his headstone, but on the other hand, if we keep our inner eyes open, we can see a lot of conditions, deduce a lot of conclusions and go away with a lot of decisions and pledges as to our future conduct.

Here is a little pile of bronze bushings, looking as good as any we have seen. What is the matter with them? Bore is too large. Reamer was delivered by the tool crib but it made the hole too big.

Didn't the tool room inspect the reamer before it was taken to the operator? Apparently not—an inexcusable oversight, but do *we* do it in *our* plant? We had better look into it.

Even if this reamer was too large, why is there more than one scrap bushing? Why didn't the operator discover it after he made the first one? Doesn't the workman gage his work? Evidently not. Do *we* do it in *our* shop? Let us look into this matter too.

Here is a lot of hand wheels, partly finished. What is wrong with them? Why, the bore of the hub is full of blow holes. Apparently they did not use a core. Let us make sure we do not make the same mistake.

Here is a bunch of gears looking as husky and handsome as any gears of our acquaintance, made of chrome-nickel steel, carbonized, heat treated and hardened. Tooth shape wrong? No, not at all, but the hardening process has made the gears out of round a little more than is good for them. They don t run noiselessly.

We go away with added respect for a company which dares to scrap such valuable material rather than its ideals.

In another place we have innumerable castings which are to be broken up, full of sand holes, blow holes and scabs, some crooked, some with too much finish, others with not enough material to clean them up, no two castings the same. We ask if this is a regular performance and we are told that what we see here is not quite so bad as the average. Made in their own foundry too! What is wrong with the management that they permit the foundry to make castings which cost the machine shop part, maybe all, of its profits?

In still another place we find a mass of tool steel bits, broken drills, milling cutters minus some of the teeth—altogether a quantity all out of proportion to the amount of business done in the shop. On our inquiry as to whether this is the accumulation of the last ten years we are told that it is not, but that a great many tools are broken and spoiled on account of the steel with hard spots in it. If we were permitted to inquire further we would find that the purchasing agent can buy this steel for a fraction of a cent a pound less. Fine economy this.

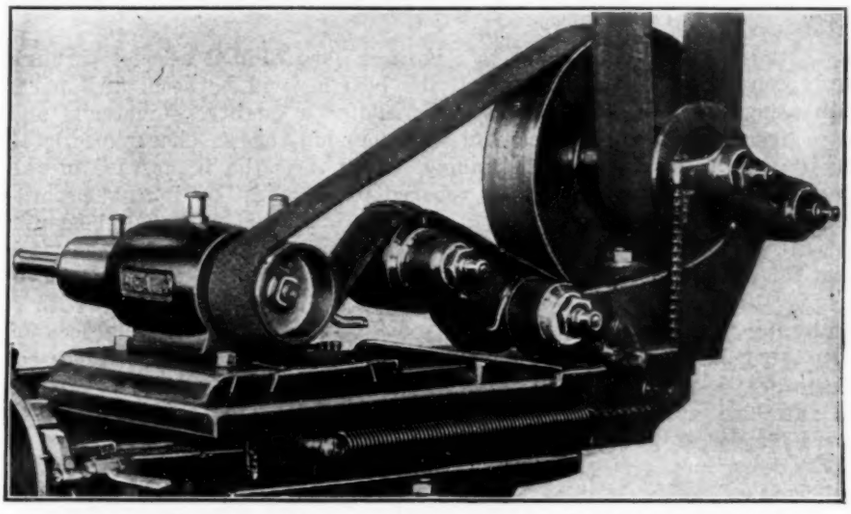
Yes, the scrap heap can tell its tales if we are only willing to listen.

Shop Equipment News

Belt Tightener for Heald Internal Grinding Machines

The Heald Machine Co., Worcester, Mass., has just brought out a device in the nature of an attachment to its internal grinding machines, for the purpose of delivering greater power to the wheel spindle.

In this type of machine, the spindle is driven through the intermediary of a two-step pulley, which receives on its smaller step the belt from the overhead countershaft, while from the larger step the belt leads off to the pulley of the wheel spindle. This



BELT TIGHTENER FOR HEALD INTERNAL GRINDING MACHINE

double-step pulley, which is in effect an intermediate countershaft, runs upon ball bearings, and is so mounted upon the end of a swinging link that only the tension of a coil spring is opposed to the pull of the belt, and thus no shock is transmitted from the belt to the bridge of the machine.

In the new device the faces of the pulleys have been widened so that the vertical belt from the countershaft is now 3 instead of 2 in. wide, and the belt from the large step to the spindle is 2½ in. in place of the 1¾-in. belt formerly used. The feature of the device is a swinging idler or belt-tightener, so supported from the same base as to press upward against the slack side of the belt under tension of a torsion spring.

Before the adoption of this device the lower side of the belt was practically horizontal and the centrifugal force engendered by the excessively high speeds at which the belt ran, tended to reduce the arc of contact between belt and pulley very materially. With this tightener in place, the wrap of the belt is much increased, so that at no time is it less than half the circumference of the pulley.

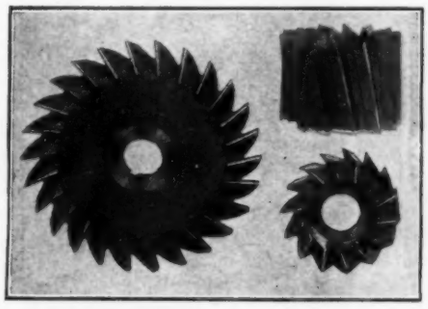
A phenomenon that demonstrates the effect of centrifugal force and driving strain to lengthen the belt may be noticed when the machine is started from a standstill. As the speed increases and gradually climbs to normal, the small tightener pulley will swing upward about 1 in. from its standing position, thus increasing instead of diminishing the amount of wrap. The driving force is thus increased proportionately.

A series of small grooves are cut in the faces of both driving and driven pulleys, for the purpose of allowing the escape of trapped air, and thus increasing the efficiency of the drive by eliminating the cushion of air that is formed between the surfaces of the belt and the pulley in high speed drives.

This countershaft and belt tightener will be made as standard equipment for the Heald internal grinders, and is so designed as to interchange with the corresponding parts of the older machines, upon which it may be placed without fitting, as the mating parts are the same in each case.

Gorham Standard High-Speed Milling Cutters

The Gorham Tool Co., Detroit, Mich., has placed on the market a line of standard high-speed milling cutters that is claimed to be particularly adapted to the requirements of large-scale production. The cutters



GORHAM STANDARD HIGH-SPEED MILLING CUTTERS

are made from a selected grade of high-speed steel, and the heat-treatment used is the result of several years of experimentation and research.

The design includes the features of the coarse-tooth type of cutter, in a semi-coarse tooth cutter. The number of teeth determined as the Gorham Standard is stated to be the result of careful research to determine the horsepower required to remove given amounts of stock with such points as number of teeth, kind of stock, size of cutter and heat-treatment, all considered. The design provides for a large amount of chip clearance.

Cutters with the standard number of teeth are furnished in plain, side and end milling types in all standard sizes. Cutters in which the same features of design are embodied, but with finer or coarser teeth, can be furnished on request to suit the requirement of special work.

The Spherical-Type Roller Bearing

By H. E. BRUNNER
Chief Engineer, S K F Industries, Inc., New York, N. Y.

Anti-friction bearing intended for heavy-duty work—A Swedish development that has proved successful—Principles of design and operation

THERE HAS RECENTLY been developed and placed on the market a new design of roller bearing, which differs so markedly from the conventional types, that a consideration of its mechanical features should be of general interest. Sufficient experience has already been had, in actual service, to establish its merits, and the purpose of the present article is to describe the construction and to analyze the design from a technical point of view.

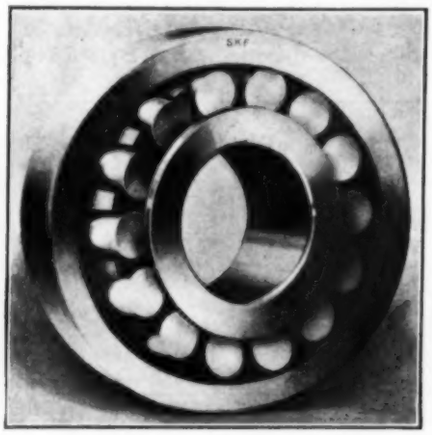


FIG. 1—S K F SPHERICAL-TYPE ROLLER BEARING

For some time past, those directly concerned with engineering progress in the use of anti-friction bearings have recognized the need for a high-grade bearing combining features that have heretofore been regarded as characteristic of separate and distinct types. For example, there has been a demand for a bearing having the low frictional qualities and the precision of a ball bearing and at the same time a load-carrying capacity comparable with that of a roller bearing, but not obtained at the sacrifice of true rolling, with enforced rigidity. This has been particularly true in fields of application where the space limitation for the bearing mounting is important, where conditions of shaft loading and lubrication are conducive to a high efficiency with plain bearings, and where the shock loads are severe. Examples of such conditions are found in the various types of roller mills and drives, in railroad work, and in heavy machine drives.

The Aktiebolaget Svenska Kullagerfabriken of Gothenburg, Sweden, undertook in 1918 to study this problem. A careful analysis was made of the limitations affecting both the ball and the roller bearing in applications of the kind in question. This work was followed by extensive tests of a large number of different types of bearings, the results of which were systematically studied. In this way there were discovered certain desirable characteristics of the various types and likewise objectionable ones, always from the point of view of the heavy type of service for which it was necessary to provide.

With the conclusions of this experimental work at hand, the task was to devise a bearing which would incorporate the maximum number of desirable features without any of those which had been found to be detrimental. The problem was further extended by the necessity of adapting the design thus developed to the already established standard sizes for ball bearings. This work was accomplished with notable success, and the "spherical type of roller bearing" is the result of the research and study outlined above. In Fig. 1 such a bearing is shown with the outer race swung from its normal position.

Referring to Fig. 2, a longitudinal section through the mid plane of the bearing will be seen. All parts of the bearing are made of a quality of material and with the careful workmanship that is characteristic of a good ball bearing. Part *A* is the inner race of the bearing. It is secured to the shaft or journal according to the usual methods employed with ball bearings operating under corresponding load and speed conditions. A shrink fit, press fit or tapered sleeve, together with a suitable locknut may be used. Parts *R* are the two rows of rollers. Part *B* is the outer race, ground spherical on the inner surface from the center point *O* of the bearing. The outer race of the bearing is mounted in the housing according to the usual method for a ball bearing, which normally provides a slight clearance to facilitate creeping of the race in the housing, while in service.

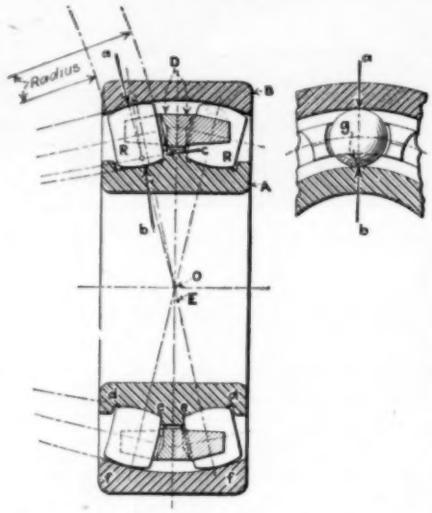


FIG. 2—SECTIONAL VIEW OF SPHERICAL ROLLER BEARING

It will be seen from the figure that the bearing is a self-contained and self-aligning unit, two properties that are of the greatest importance. The former means that when the bearing is being installed, there is no adjustment required internal to the bearing itself, thus precluding the possibility of damage through initial maladjustment. The spherical surface of the outer race provides for self-alignment of the bearing to

compensate for shaft deflections and unavoidable inaccuracies in machining and locating the housing. These two features are of particular importance in the field of heavy machinery for which the bearing is designed.

The internal construction of the bearing will be made clear by further reference to Fig. 2. On the inner race the roller *R* contacts with the groove *de* throughout its length, thus providing the line contact of the roller bearing. On the outer race the roller contacts at the point *f;* and due to the closeness (in a longitudinal plane) of the roller curvature radius *Ef* with the race

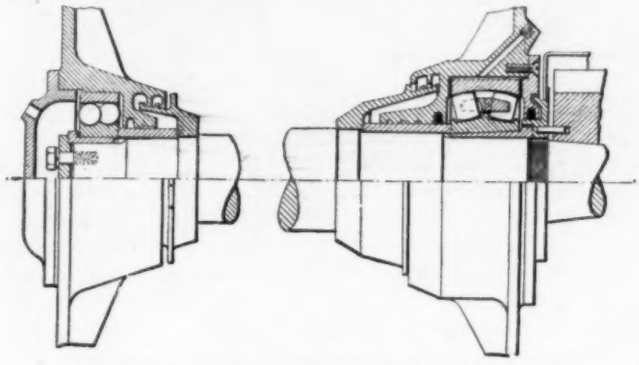


FIG. 3—BEARING MOUNTING FOR ELECTRIC RAILWAY MOTOR

curvature radius *Of*, the contact is very intimate and is fully comparable with that of the typical deep-groove type of ball bearing provided with a ball of very large diameter.

It will be seen that the rollers are barrel shaped and have their largest diameter toward the inboard end. Actually the contact between the roller and the outer race will be a substantial area, due to the elasticity of these parts, and consequent deformation under load. From this fact it will be seen that the spherical-type roller bearing embodies the theoretical characteristics of both point contact of the ball bearing and line contact of the roller bearing. The desirability of this combination of point contact on the outer race with line contact on the inner race was one of the conclusive results of the experimental work which preceded the development of the bearings. It should be observed that the line contact is provided on the inner race, which as is well known, is the weaker element in the typical annular bearing. The result is an excellent equalization of stress between the inner and outer races.

Any type of bearing which aims to obtain line contact must provide some means for maintaining the parallelism of the axes of the rollers with the shaft. Otherwise the skewing of the rollers destroys the line contact and substitutes a very objectionable form of point contact. In the spherical type of roller bearing the desired result is accomplished in a positive manner by means of the guiding flanges *ee* on the inner race. It will be seen that both the flanges and the ends of the rollers are ground spherical surfaces, with their center at the point of intersection of the shaft axis and the axes of the rollers. Since the guiding flanges and the roller ends have the same center and the same radius of curvature, they contact over an area shown at *g* in the end view.

The arrows *a* and *b* which represent the resultant forces on the roller from the outer and inner races, respectively, are inclined to one another by a small angle, which is the included angle of the cone circumscribing the roller. This means that there is a wedging force holding the roller in contact with the guiding flange and developing the reaction *c* at the center of the area of contact with the guiding flange. As soon as a roller skews in the slightest degree, there is no longer a contact area between the end of the roller and the guiding flange. The contact is then at a single point on the edge of the roller, and the force *c* together with the resultant of the inner and outer reactionss *a* and *b*, forms a couple which immediately counteracts skewing tendency and returns the roller to its position of equilibrium.

The rollers are maintained in a parallel relation with the shaft axis by this positive action, which provides in the design of the bearing itself a stable equilibrium of the roller. The advantage of this provision is immediately reflected in the low coefficient of friction shown in tests of the bearing, this coefficient being somewhat greater than that of a ball bearing, but markedly lower than in other types of roller bearings.

The retainer *D* is carried on the land of the inner race and serves only to separate adjacent rollers and to prevent their contacting with one another. The retainer is usually made of bronze and is so designed that it holds the rollers from dropping out when the inner race is deflected relative to the outer race, as for cleaning.

The spherical roller bearing, developed as it was to meet the requirements of a specialized field of heavy-duty applications, has already found a wide demand. Some of the present installations and typical designs for service in this country are pictured herewith.

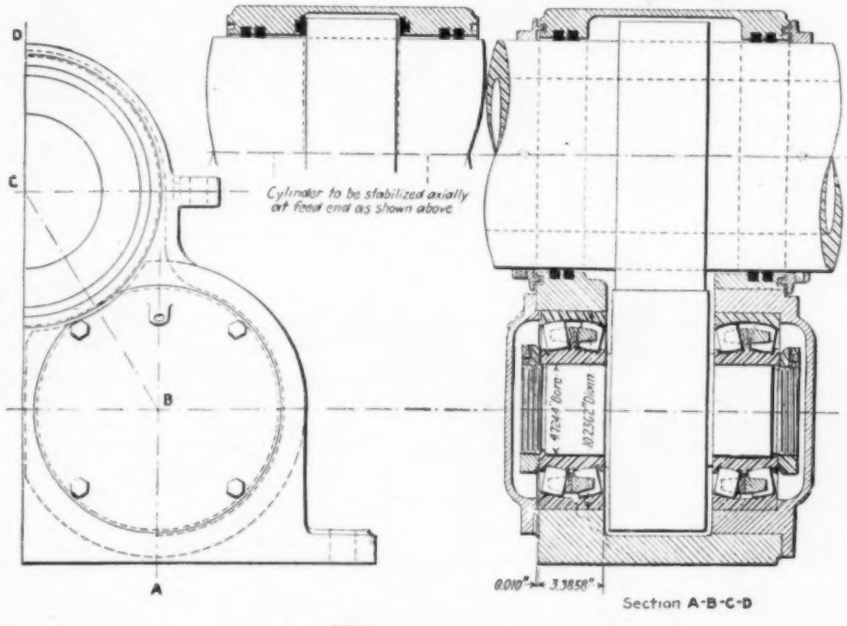


FIG. 4—TRUNNION MOUNTING FOR CEMENT TUBE MILL

In Fig. 3 is illustrated an electric railway motor with a spherical-type roller bearing on the pinion end of the armature shaft. The inner race is secured to the shaft by means of a tapered sleeve. A ball bearing is used on the opposite end of the shaft where loads are comparatively light for the given space limitations.

A trunnion mounting for a cement tube mill is shown in Fig. 4. The rollers which carry the hardened journal ring are supported on spherical-type roller bearings. Fig. 5 illustrates a roller bearing pillow block designed for heavy service such as a cable sheave on a mine hoist.

Attention is directed to the provisions for excluding dust and dirt from the housings and for the prevention of leakage of the lubricant. The latter consideration is of particular importance in the motor mounting shown in Fig. 3.

It is believed from the experience had with the operation of this type of bearing to date, that its field of application will be broadened beyond the scope originally contemplated in the design of the bearing. This applies particularly as regards to the speed rating. It has further been found that, in equivalent sizes, the spherical roller bearing has about twice the load capacity of the corresponding ball bearing. The thrust capacity of the bearing is substantial, making it well adapted to the carrying of combined loads. It is important to observe that the thrust capacity is obtained by the angular contact of the load reactions *a* and *b* in Fig. 2, and is not dependent on the guiding flange reaction *c*.

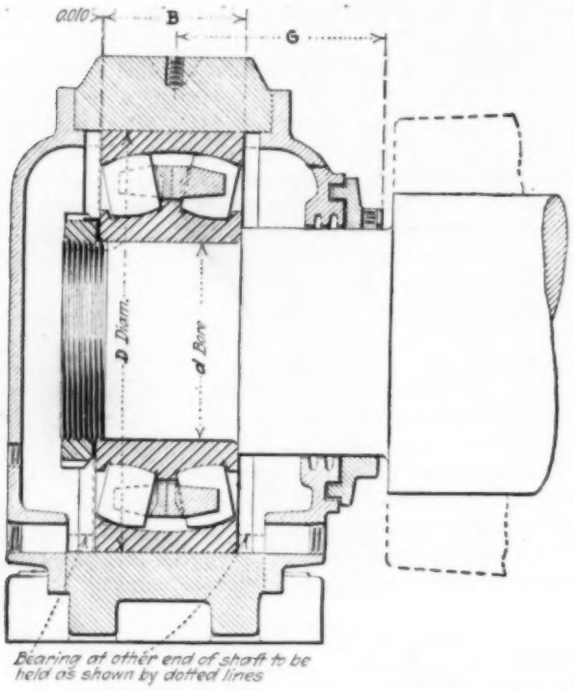


FIG. 5—PILLOW BLOCK FOR CABLE SHEAVE, SHOWING SPHERICAL ROLLER BEARINGS

The question of lubrication is very similar to that incurred with ball bearings under similar load and speed conditions. Oil is considered preferable, but grease may be used where conditions of design require. The saving in amount of lubricant required as compared with plain bearings is precisely the same as with ball bearings.

The housing construction and the provision of suitable seals to exclude dirt and water from the bearings is the same as in the standard practice with ball and roller bearings.

The spherical roller bearing was originally developed and applied in Sweden. Since that time bearings have been installed in the United States, England, France, Germany, Japan, Peru, Brazil, and a number of other countries. The installations that are in service have shown conclusively that this bearing meets an imperative need and is well adapted to the requirements of heavy-duty service.

These applications include: Railway journal boxes, steam and electric; railway motors; steel mill motors; electric railway motor-generators; paper machines; rolling mills, rolls and flywheels; hoisting machinery; tube mills; rotary furnaces; steam engines, crank pins; log frame saws, crankpins; flour mills; flaking mills; and a number of other miscellaneous applications.

The self-contained and self-aligning features of the spherical roller bearing, together with its exceptionally low coefficient of friction and rugged load-carrying capacity, characterize it as a distinct advance in the development of anti-friction bearings. It offers possibilities that conform with the progressive principles of modern engineering practice.

Standardization of Catalog and Magazine Sizes

BY HARRY N. PARSONS
Chief Engineer, U. S. Ball Bearing Mfg. Co.

I have read your interesting article on the standardization of catalog sizes on page 757, Vol. 57 of *American Machinist*, and would like to add a few comments.

The purpose of a catalog is to give in a convenient and brief form descriptive information as to a manufacturer's product, and that form is made use of by purchasers either immediately or at some future time. It may be either filed or in constant use and carried around; and therefore, it seems to me that there is a necessity for only two sizes of catalogs. The 8½x11 in. size is a logical selection because of its present acceptance as the standard letter sheet, which also fits it especially for filing and is commensurate with the capacity of filing devices. For catalogs that are to be carried around, the pocket size is the other size that should be used, from the standpoint of convenience in constant handling.

8½x11 THE LOGICAL SIZE

What holds true for catalogs is true for magazines also. How many various sizes of magazines are published today? Now, 8½x11 is the logical size also for magazines that are referred to at the desk. Magazines containing fiction and other reading matter can be maintained at the regular book size for comfort and convenience while reading. No one who has attempted to file information from magazines has not been confronted with the problem of conveniently filing the large awkward sizes of sheets that appear among our machinery and technical magazines. For the sake of convenience in preserving and filing, the 8½x11 in. size for magazines is a logical selection.

Standardization eliminates waste, promotes efficiency and therefore should be encouraged, and it is logical that we should pay closer attention to this matter in deciding upon the sizes of our published material.

News Section

December Exports Show Big Increases

Exports of metal-working machinery took a sudden upturn in December. The total value of such exports, according to returns to the Bureau of Foreign and Domestic Commerce, was $1,362,376. This is an increase of $435,383 over the value of exports in November and an increase of nearly $600,000 over the exports of December, 1921. The principal increases are in the number of lathes, boring, drilling, polishing, sharpening and grinding machines. The detailed figures follow:

EXPORTS METAL-WORKING MACHINERY

	Dec. 1922
Lathes	$106,818
Boring and drilling machines	79,386
Planers, shapers and slotters	28,169
Bending and power presses	20,146
Gear cutters	9,838
Milling Machines	32,095
Sawing machines	3,507
Thread cutting and screw machines	29,977
Punching and shearing machines	8,670
Power hammers	11,974
Rolling machines	1,460
Wire-drawing machines	7,985
Polishing and burnishing machines	3,876
Sharpening and grinding machines	100,391
Chucks, centering, lathe, drill and other	27,156
Reamers, cutters, drills and other parts for machine tools	77,139
Pneumatic portable tools	62,624
Foundry and molding machinery	27,317
Other metal-working machinery and parts of	722,848
Total metal-working machinery	$1,363,376

Engineers Discuss Service Problems

Interesting and instructive discussions given by J. W. Lord, Service Manager, Harrolds Motor Car Co., New York, and B. B. Bachman, of the Autocar Co., Ardmore, Pa., were enthusiastically received Thursday evening Feb. 8 at a joint meeting of the Metropolitan Section, S.A.E. and the Automotive Service Association held at the Automobile Club, New York. There were present about 200 members of these associations who enjoyed dinner and then gave attention to the papers which were read by the two men. The paper of Mr. Lord was printed in the Feb. 8 issue of *American Machinist* under the title, "Does Factory Engineering Organization Give Full Consideration to Service and Service Problems?"

Mr. Bachman's paper was entitled "Service from the Engineer's View." He stated that it was the engineers duty to put himself in close relation to the other departments in the factory such as the sales department, service department, production organization and others. A close study of service reports further research for methods to help the service department and numerous other duties were outlined by Mr. Bachman.

Lee J. Eastman, a "neutral" presided as chairman of the meeting. Mr. Eastman is the president of the Automobile Merchants Association of New York City and is the representative of the Packard Motor Car Co. in New York. While he, like every other merchant, is vitally interested in the service problems, Mr. Eastman is not connected with either association.

Comments were made and points were raised by Col. James Florida, well known to the automobile industry, Edward J. Rabidoux, Eastern Service Manager for the Reo Co. and W. E. Kemp, chairman for the Metropolitan Section of the S.A.E.

While no definite action was taken by the associations the meeting was acclaimed by many to be the beginning of an educational campaign for service stations and their work.

Report of Newton Steel Company

The Newton Steel Co., Youngstown, Ohio, reports gross business for 1922 of $4,812,778, profits of $1,059,278 and a surplus after dividends and other expenditures of $351,903 which brings the profit and loss surplus up to $535,928. The yearly balance sheet shows that the current assets are $1,547,335 and the liabilities are $350,093. During the last year the company has shipped approximately 53,237 tons of sheets.

Consolidated Machine Tool Reports Capacity

Recent reports given out by the Consolidated Machine Tool Corp. of America, show that business is running at normal capacity and conditions are in excellent shape. On Jan. 1 there were on the books of the company unfilled orders to the amount of $1,125,000. In December there were received orders to the amount of $524,000. Some of the plants are working overtime and in others capacity is the rule with additional men being hired as quickly as they are obtained.

Improved Railroad Conditions

Recent reports from the American Railway Association show that on Jan. 15 there was a surplus of 28,282 freight cars in good repair which was an increase over the previous week of 7,856. Further reports of the association showed that on Jan. 15 there were 162,832 freight cars in need of heavy repairs which was a slight reduction since the first of the year. There was an increase in the number of cars in need of light repairs, but the report generally was regarded in a favorable light.

Increases Capital Stock

By an amendment recently filed at Dover, Del., the Columbia Steel Corp., San Francisco, Calif., increased its capital stock from $20,000,000 to $110,000,000.

Carr Retires as President of Jos. T. Ryerson & Son, Inc., of Chicago

Clyde M. Carr has retired as president of Joseph T. Ryerson & Son, Inc., Chicago, iron, steel and machinery corporation. On account of poor health Mr. Carr has been unable to take an active part in the management of the firm for the past two years. He will continue, however, as a director. At the regular annual meeting of the directors, Joseph T. Ryerson was elected president. Mr. Carr was born in Illinois in 1869 and first became associated with Joseph T. Ryerson & Son, Inc., in 1890. He has taken a very active part in the management of the firm's affairs and in 1911 was elected president. Mr. Carr has always been an active leader in civic and industrial circles and his far reaching influence has accomplished much wherever he has been interested. He is president of the Orchestral Association, director of the Corn Exchange National Bank; trustee of the Art Institute of Chicago and the Chicago Plan Commission; member of the American Iron & Steel Institute; member of the Commercial Club and other clubs in Chicago and New York.

CLYDE M. CARR

JOS. T. RYERSON

Joseph T. Ryerson, the grandson of the original Joseph T., succeeds to the presidency with a background of 22 years in the steel business. He was born in Chicago in 1880 and immediately after graduating from Yale in 1901 went to work for the American Sheet Steel Co., now the American Sheet & Tin Plate Co., at its mill in Vandergrift, Pa. In October, 1902, he started with Joseph T. Ryerson & Son, Inc., at Chicago and in 1904 was elected treasurer, becoming vice-president in 1911.

Mr. Ryerson is actively interested in the National Chamber of Commerce and other general industrial work. He is a director of the Peoples Trust & Savings Bank of Chicago and the Morris Plan Bank of Chicago. He is a member of the American Iron & Steel Institute, the Industrial Club of Chicago and other clubs and associations in Chicago and New York and is well known in the machinery field generally.

Latin America a Profitable Export Field Says Dr. Julius Klein

BEFORE an audience of manufacturers, Dr. Julius Klein, Director of the U. S. Bureau of Foreign and Domestic Commerce, recently gave a very interesting address. Part of this is given below:

"I don't know why it is that otherwise discreet and cautious business men throw their discretion to the winds the moment they begin to think about sending things down to the sunny shores of the south. In the first place, any approach to a Latin-American trade broker must be governed by the fact that Latin-America has an extraordinary diversification of her people and of her trade. It might surprise you a little to know that negroes are as scarce on the streets of Buenos Aires as red Indians are on the streets of Cleveland; that the percentage of white people in Uruguay and Argentina is more than the percentage of white blood in this country.

"The type of people there in the interior of the country is surprisingly like our own Middle West for more or less obvious reasons. They raise the same things and have the same problems in developing vast flat stretches. They need barbed wire for ranches; harvesting machinery. They need the thousand and one things which were needed in the development of our own country.

"Thus far our efforts have been confined to the two nearest republics in that section—Cuba and Mexico. They take nearly twenty per cent more of our exports than do all of the ten South American countries. The thing for us to do is to look into those big competitive markets farther south where people are living under conditions more or less approaching our own and where we ought to be able to satisfy them just as we satisfy our own people.

Dispelling an Old Superstition

"Secondly, I want to dispose of that utterly foolish clap-trap about being careful to sell them just exactly what they ask for. Of all absurd things I think that is about the worst. An up and coming Argentine prides himself on the fact that he is looking forward and that he has and his country has a very promising future. He talks exactly like the California or Canadian or Australian, about the magnificent future of his country. He wants to learn about new machinery, new appliances, and the mere notion that because the thing has never been sold in Latin-America before, is the best reason for not selling it there, is utterly foolish.

Wall Street and Chile

"There are one or two factors that have come in to help us very materially in our foreign trade. In the first place, the enormous increase of American investments in those areas. Before the war, we had about $2,000,000,000 invested in Latin-America—nearly half in Mexico. Today we have about $3,000,000,000 and almost all of that extra billion has been put down in South America and it is going in at the rate of almost tens of millions and in some cases hundreds of millions.

"Nearly half of the foreign bonds quoted on the New York Stock Exchange are from Latin-America. These mean particularly the development of new enterprises in those countries. Take, for example, these new Chilean bonds. They are going to be used for the electrification of railways, for the development of a hitherto untouched resource—hydro-electric power. The same thing is true down in Brazil.

"The money that is going to go into South American machinery and the initial installation is simply going to be a beginning of what is coming after, because as this new American machinery makes good—and it will—there is going to be room for all other developments and that brings up the precise point I want to bring up about the changing character of Latin-America.

"Don't assume that because you had a discouraging report about prospects down there in 1913, or whatever year it may have been, there is no sale for that now. The place has changed utterly—entirely. I doubt if there is a part of the world which has had more dramatic changes, relatively less imposing, of course, but nevertheless basic, than the Latin-American countries. Transformations of industries and new industries brought into being, because of installation during the war. New capital brought in in enormous quantities, possibly American, and enormous numbers of new sales agencies.

Sixty Branches of American Banks in South America

"We didn't have a single branch bank before the war. Now we have about sixty. We don't have to depend upon British or French or German banks now. Our documents can go through American hands. Before the war we had hardly any cable service. Today the whole country is looped with American cables. That is a very important part of foreign trade. That is one reason why the Japanese are handicapped. It takes almost a week for their cables to get through.

"Shipping service has considerably improved. You remember the old truism that it was easier to travel to Latin-America by way of Europe. The west coast of South America is right at our doorstep now—direct line south of New York. This means, of course, that we are in an immensely more favorable position than any of our European competitors with reference to that very important section. Our shipping service has improved on the east coast as well.

"Summarizing all of our ten leading industries here—that leaves out, of course, many that we have not tabulated—but taking just your ten industries as examples, more or less, it will be safe to say that about thirty per cent of everything that you produce for export goes to Latin-America and it is highly important for that reason that you should have your very latest facts in that important field."

Worthington Corporation to Insure Help

Plans are being formulated by the Worthington Pump & Machinery Corp., New York City, by which the 10,000 employees of the concern will be issued sick benefit and life insurance. The new welfare work was decided upon after a close study by officials of the corporation and every safeguard will be put into effect to see that the employees are the recipients of proper benefits under the terms of the policy. C. P. Coleman, president of the Worthington Pump & Machinery Corp. has issued the following statement:

"A close study of the problem reveals that sickness and death more often shatter the happiness and existence of the home than any other of the great disturbing factors in life against which the home must be protected.

"The insurance provisions of the plan are financed entirely by the corporation, and the amount of insurance received varies with length of service. These benefits range from a benefit of $250 applicable to an employee who is a member of the benefit association for more than six months but less than one year, up to $1,000 to a worker who is a member over five years."

Detroit "Suffering" from Prosperity

A committee of railroad experts has been appointed in Detroit to seek remedies for the freight congestion which has been blocking the railroad yards in that city during the past two weeks. The necessity of the committee has arisen from the unusual prosperity which is attending manufacturers in Detroit who assert that there has been a return to post-war activity.

John L. Lovett, secretary-manager of the Detroit Manufacturers Association, stated that the prosperous condition was most noticeable in the motor making trades and its many branches which are located in Detroit. He is optimistic in regards to industrial conditions and says that if Detroit is able to get the proper aid that Michigan will see an unprecedented era of prosperity and that this will be reflected by the entire nation. Reports show that at the present time there are 300,000 men employed in the various industries which is the largest number in the history of the city, war time included.

Many New Locomotives Have Been Ordered

Exceptionally large orders are reported by both the Baldwin Locomotive Works and the American Locomotive Co. The former booked $11,337,000 of new business during the month of January as compared with only $495,572 in January, 1922. Operations are now reported to be on a basis of seventy-five per cent. The largest single order received during January was for 100 engines for the Pennsylvania Railroad. The unfilled orders on hand and at the Works are estimated at $47,000,000, enough to keep them busy for the next eight months.

Orders for 163 locomotives have recently been received by the American Locomotive Co., the largest single order coming from the Chicago, Rock Island & Pacific railroad that asked for 10 mountain type and 30 Mikado type engines. The Buffalo, Rochester & Pittsburgh has ordered 31 engines; Chicago and Eastern Illinois, 10; Virginian Railway Co., 15; Central of Georgia five; New York, Chicago & St. Louis, six; and several other roads and mining companies have booked good sized orders.

Unemployment Figures Are Most Encouraging

From every part of the country come reports that unemployment has declined noticeably during the past few weeks and that the country at the present time is better employed that it has been in many months. There has been less bread line in Chicago than usual and this is attributed to better industrial conditions and mild weather which were favorable for outdoor work.

Cities of the Northwest are anxious to get lumberjacks and men familiar with the building trades. In several cities in Ohio it is reported that there is less unemployment this year than last and Columbus reports that last January there were 15,000 men out of work, whereas this year there are only 3,000. In Iowa it is reported that the decrease during the past year has brought the percentage of unemployment down fifty per cent and that at the present time there are only about 20,000 people out of work in the entire state.

In Kansas less than 5,000 are reported as out of work in the state. Eastern states have been busy for some time and unemployment is extremely low in New York, Michigan, Pennsylvania and New England States. It is the opinion of many that within the next few months the country will see even less unemployment than now and that more money will be expended by railroads and other large industries for improvement and equipment which will be reflected in the employment reports.

Lee Condemns Government-Owned Railroads

Declaring that if the Government takes over the railroads it will be an end to our present form of government, Ivy L. Lee, counsel on public relations for the Pennsylvania Railroad, at a recent Republic Club luncheon, advocated the abolition of the United States Railroad Labor Board and also assailed William G. McAdoo, former Director General of the Railroads, as the man who had spread harmful propaganda to the railroads. Mr. Lee explained that the idea had been generally accepted by railroad workers that if the government owned the railroads, conditions would be improved and he blamed Mr. McAdoo for fostering this idea when he had charge of the railroads during the War. He also stated that the Railroad Labor Board invited controversy rather than prevented it.

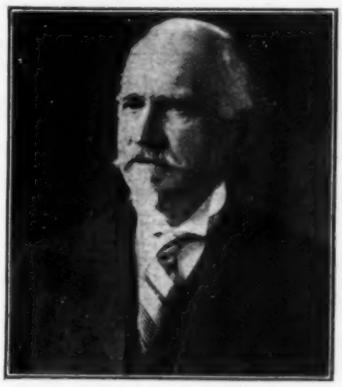
Big Improvements Planned By Illinois Central

Plans for the expenditure of $45,000,000 during the coming year has been announced by the Illinois Central Railroad. Of this amount, $27,000,000 will be spent on the road bed and the remaining amount on equipment. It is planned by the railroad to commence the work immediately and orders for the equipment will be placed within a very few weeks, it is understood. Fifty locomotives, 4,000 open top cars, 1,500 box cars, 500 automobile cars, 60 passenger cars, five dining cars and 125 cabooses will be some of its equipment which will be ordered.

It is further stated by officials of the company that a considerable amount will be spent for new machinery and tools for use in the various shops of the Illinois Central. The company has spent a great deal of money on its property during the past two years and it is contemplated that it will spend a total of $118,000,000 during a period of three years.

Clarence S. Bement Dies in New York

Clarence S. Bement, aged 80 years, former president of the Bement-Miles Co. and a director of the Niles-Bement-Pond Co., New York, died Jan. 27 in



CLARENCE S. BEMENT

his apartments at the Longacre Hotel following an illness of several years.

Mr. Bement was well known for his collections of books, coins and mineral specimens. His books were the nucleus of the Harry Elkins Widener Library which was presented to Harvard University recently. J. Pierpont Morgan purchased his collection of mineral specimens in 1905 and it is now on exhibition at the Museum of Natural History, New York. It is said upon good authority that his collection of early Greek and Roman coins is the most complete to be found and rivals any other similar collection.

He was born in Indiana, but lived most of his life in New York City. He succeeded his father as president of the Bement-Miles Co. His wife died sixteen years ago. He is survived by two daughters, Mrs. J. Clark Moore of Philadelphia and Mrs. A. Ludlow Kramer of New York. He was a member of the Union League, the Historical Society of Pennsylvania, the American Philosophical Society, Hamilton Whist Club, Numismatic and Antiquarian Society and the Pennsylvania Society of Sons of the Revolution. Mr. Bement was also one of the early supporters of the Philadelphia Orchestra.

British Iron and Steel Improves

The British iron and steel trades closed the year at the best level reached in 1922 and much encouraged by lessened competition from the Continent, larger overseas demand and better prospects for the main domestic users, such as railroads, shipyards and engineering works. These branches of the industry, although still operating at small part of capacity, are reported by Commercial Attaché W. S. Power to the Department of Commerce, as being about to restart plants which have remained idle since last Spring.

Extend Time of Tax Return Filing

Internal Revenue Commissioner Blair this week extended the time of filing complete income tax returns by corporations. A general extension of time has been granted domestic corporations up to and including June 15 for complete returns of income for the calendar year, 1922, the fiscal year ended Jan. 31, 1923, and the fiscal year ending Feb. 28, 1923, conditional upon the filing of tentative returns with the proper collector of internal revenue on or before March 15, April 16 and May 15, 1923, respectively, accompanied with at least one-fourth of the estimated amount of the tax due, together setting forth the reason why the return cannot be completed within the prescribed time and a formal request for extension.

Railroad Improvement Plans Receive Approval

The Interstate Commerce Commission has approved the program formulated by the Baltimore & Ohio Railroad for the issuance of $13,875,000 of equipment trust certificates for the acquisition of 8,000 cars of which 6,000 will be of the open top type suitable for handling building materials, coal and coke. The certificates are to be issued by the Girard Trust Co., Philadelphia.

The Commission also approved of the plans of the Tennessee, Alabama & Georgia Railroad to construct an extension of its lines from Gadsden, Ala., to a connection with the Seaboard Air Line near Odenville, Ala., a distance of approximately thirty-six miles.

Body Building Plant Bought By General Motors

The General Motors Corporation has purchased the Milburn Wagon Works, Toledo, Ohio paying $2,000,000 for the factory, lumber plant and twenty acres of land in the vicinity of the works. According to the terms of an agreement, the Milburn Co. will have charge of the plant for another two months, and will continue in its electric automobile business. The General Motors Corporation at the end of this period will take over the plant and commence its program of expansion. The Milburn Works have been building bodies for the Oakland and Oldsmobile for some time and have been in business since 1872.

No Change in Railroad Wages for Another Year

According to decisions rendered by the United States Railroad Labor Board, there will be no changes in either the working conditions or the wages of railroad employees for another year. In the case of seventeen railroads and subsidiaries, the Board postponed further action on the petition to allow a reduction of wages. The postponement was taken "until some time subsequent to October, 1923." The same period of time was designated for a postponement on the cases submitted by firemen's organizations on a large number of railroads who petitioned that two firemen be assigned to the larger type engines.

Where Germany Suffered the Most

How the workmen are paid and how they like it—Wages and the cost of living—What the official figures show—Few machine novelties

BY OUR BERLIN CORRESPONDENT

THE INDIVIDUAL opinions one hears of the standard of efficiency are greatly divergent. In a number of cases it is stated that pre-war efficiency has been reached, while in others the efficiency is estimated at not higher than 40 per cent of the pre-war standard. Between these two extremes almost any grade may be heard. As to the reason of the lack of efficiency the opinions are, however, almost unanimous. Hardly ever is the argument heard of reduced physical ability. The workmen give the impression of well-fed and well-clad persons. Payment by the hour and the unrest amongst the men, caused by political as well as economical dissatisfaction, are no doubt back of the lack of efficiency. A system of piece work payment has been re-introduced, marred, however, by a guarantee of minimum earnings but still giving, generally speaking, good results, especially during the last months, when the rise of living costs acted as a spur to the earning impulse.

Between Mechanics and Laborers

In the case of the skilled men, the advantage they enjoy in wages over the unskilled men, is further aggravating matters. The latent unrest is making itself felt constantly.

The debating craze amongst the workmen has developed strongly. It is bringing to the front the men with good voices and some oratorial gifts. These men are in the majority of the younger class, who carry the opinions of the rest by aggressiveness and loud voices. This is the type that the shop representative is mostly chosen from. Manufacturers questioned with regard to the effects of the shop council law are generally very reluctant, fearing that their opinions may appear in print, thereby unconsciously admitting the awe, the council institutions of the labor class are still held in.

Wages are now keyed to the index of cost of living, after their quick march has trampled down the system of their adjustment by dilatory negotiations. This index is so low, that the unbiased observer cannot help but come to the conclusion that it is "cooked." If in spite of that the majority of workmen appears healthy and well-fed, it is mostly for the reason, that they are making money outside of their working time by odd jobs, trading, or any other method presenting itself.

What the Figures Show

The foreign trade of the machine building industry in Germany for the year 1922 shows a large balance on the export side. It has further developed satisfactory, but, with a few exceptions, pre-war figures have not been reached.

It should be noted that in the returns of 1922 the export and import of November and December are based upon preliminary figures.

The following figures show the machinery import and export in 1922 in comparison to the last 3 pre-war years:

Machinery Import and Export

Metric tons

	Import	Export
1911	76,129	476,220
1912	77,939	536,681
1913	80,381	532,316
1922	10,797	455,066

Comparison with the year 1921 is impossible, as export returns for the first 4 months of the year have never come out. From the statistics available it appears however, that quite a considerable increase of export as well as import has taken place. Taking into account the large reduction of imports since pre-war times, last year's foreign trade balance is extremely favorable and gives proof of the strong recovery of the industry. Considering the ad valorem figures, the result is, however, far less favorable. It can clearly be figured out that the respective returns in money are about 40 per cent below the pre-war level.

An Excellent Comparison

From the following is seen, how the chief lines of machine building contributed to the export, and how they compared with the corresponding figures in 1913:

Machinery Export

Metric tons

	1922	1913
Steam locomotives	111,422	58,127
Power Generating Machinery:		
Steam engines and combustion motors, hydraulic turbines	51,433	95,598
Textile machinery	44,661	68,429
Machine tools	49,115	74,336
Wood working machinery	14,618	12,222
Agricultural machinery	57,614	80,421
Hoisting machinery	14,387	23,768
Paper making machinery	3,164	10,668
Ore dressing machinery	3,287	13,705
Printing presses	12,896	12,209

The largest item is that of steam locomotives, which constitute approximately 25 per cent of the total export. The foreign business of this industry is nearly double in comparison to 1913. Of the other lines only wood working machinery and printing presses show a higher export than in 1913, while the others exhibit a decline. The most prominent feature of the machinery export business in 1922 is the fact that, in contrast to the preceding years, the fluctuation of the mark has ceased to exercise a material influence on it, caused evidently by the new custom to contract in gold money or at least stable currencies. The business has become much steadier.

The foreign trade returns of the machine tool business can be seen from the following figures, in which again the exports and imports of the last two months of 1922 are inserted according to preliminary figures:

Machine Tool Exports

Metric tons

	1922	1913
Total	49,115	74,336
Sarre	1,153	.....
Belgium	5,511	6,672
Denmark	1,179	1,071
Alsace-Lorraine	259	.....
France	4,792	11,907
Italy	4,169	5,733
Holland	4,157	3,641
Austria	3,802	11,309
Czechoslovakia	2,108	
Roumania	1,055	532
Sweden	1,168	1,717
Switzerland	1,572	2,591
Spain	2,063	1,506
Dutch Indies	730	424
Argentine	1,379	1,447
Brazil	1,261	1,278
All others	12,757	24,708

From these figures, which are in metric tons, it can be seen, that the export of the machine tool industry remained rather far behind that of 1913. Besides it must be noted that, alike in the export and import returns of the entire machine building industry, a part of the foreign business falls to the share of German territories alienated by the peace treaty. The following figures show the machine tool import in 1922 and 1913 and the chief countries of origin with their respective share:

Machine Tool Import

Metric tons

	1922	1913
Total	1,449	6,427
Holland	501	.....
Austria	153	160
Switzerland	221	412
U. S. America	218	4,200
All others	356	1,655

In the former list two countries, which used to be amongst the best customers of German machine tools, Great Britain and Russia, are missing. The latter country, which in 1913 received no less than 13,000 tons of German machine tools, is responsible for the greater part of the drop in the export. Another strong decline of export is seen in the case of France. This decline is, however, not as large as it appears, as the machine tools supplied to this country on reparation account are not figuring in the export lists. The machine tool imports have in 1922 arrived at approximately 23 per cent of their pre-war level, as is seen from the above figures. The machine tools listed as of Dutch origin are probably of English or American origin.

Of the total production of machine tools in 1922 no reliable figures are available. The association of the German Machine Tool Builders has in previous years started statistics of production, which, however, was given up,

as it turned out to be impossible to procure complete information. The machine tool building works of Germany are now, without any exception organized in the association, with a complement of workmen estimated at about 75 per cent of the pre-war standard.

Taking into account the reduced working time and the lower standard of efficiency, the output amounts probably to about 60 per cent of that of pre-war times. The share of the export in this production is given in various works at greatly diverging figures. The Pittler works in Leipzig for instance state only 10 per cent while the German Niles works have informed your correspondent that they estimate the share at not less than 50 per cent. These two figures are likely the extremes between which the average lies.

With regard to machine tool novelties the year 1922 has hardly produced anything. The various enterprises have worked under high pressure, besides the largely increased friction in the productive mechanism, making the supply of materials for which in pre-war times a telephone call was sufficient, a rather difficult matter, not to speak of the labor difficulties, are absorbing the greater part of the energy of the manufacturers. The uncertain future, too, is forcing manufacturers into a from hand to mouth policy, under which the development of new designs cannot prosper.

With regard to the new year gloomy views prevail as a rule. If inflation continues, a fair amount of business can be looked forward to, but not to the extent of last year's. The stringency of capital apart from other reasons, is forcing consumers to a policy of retrenchment. No delusion prevails with regard to the event of the mark stabilization, which is estimated would cause business depression of at least two years' duration.

Business Items

The New York office of the Reed-Prentice Co. is acting as selling agent for the bench lathes and internal grinding machines manufactured by the Rivett Lathe & Grinder Co., Boston. This office is in charge of P. K. Dayton and is located in Room 536, Singer Building, 149 Broadway.

The Combustion Engineering Corp. has acquired the Quinn Oil Burner and Torch Co. W. R. Quinn, former president of the latter concern, becomes manager of the fuel oil department of the Combustion Engineering Corp.

The Machine Tool Co., Kokomo, Ind., at its annual meeting elected A. B. Armstrong, treasurer, to the combined office of secretary-treasurer. He succeeds E. S. Moore, former secretary, who has resigned. The following were elected as directors: W. H. Turner, A. B. Armstrong, E. A. Simmons, C. A. Hummel, B. F. Harness, G. W. Charles and Sig Frank. Mr. Turner was chosen president, Mr. Hummel, vice president and Ross Waggaman, assistant treasurer.

The Universal Tool & Machine Co., Canton, Ohio, has been incorporated with a capital stock of $250,000. The following are the incorporators: J. E. Lehman, H. E. Black, M. F. Weida, H. A. Weida and A. B. Arbaugh.

At the annual meeting of the stockholders of the Doehler Die-Casting Co., Brooklyn, the following were elected directors: H. H. Doehler, Charles Pack, John A. Schultz, Jr., H. B. Griffin, John Kralund, F. L. Duerk, John L. Pratt, A. P. Sloan, Jr., and E. J. Quintal.

The Hunter Crucible Steel Co., Cleveland, Ohio, has been organized for the purpose of taking over the plant and property of the Electric Steel & Forge Co. The company makes hot rolled, electric and crucible furnace high-speed carbon and alloy steels. The following are the officers: President, Arthur H. Hunter; first vice-president, Frank B. Lounsberry; second vice-president, Donald Wells; treasurer, A. B. Smythe; secretary, L. H. Vinnedge; assistant secretary, F. J. Beebe; western sales agent, Frank P. Case; eastern sales agent D. M. Brown, and assistant sales agent, Shirley G. Ellis.

The following officers were elected for the coming year by the Fremont Foundry Co., Canton, Ohio: President, Charles J. Miller, Fremont; secretary, L. N. Allen, Detroit, treasurer; A. J. Kroenke, Cleveland.

Frost Steel & Wire Co., Hamilton, Ontario, Can., has absorbed the Banwell-Hoxie Wire Fence Co. Frank Walker will continue as superintendent of the Banwell-Hoxie Co.

Carman & Fryer, Indianapolis, Ind., electrical engineers and contractors, have purchased the electrical repair department of the Vonnegut Machine Co. of that city.

Personals

CHARLES R. HARE has resigned as superintendent of the New Britain Machine Co., New Britain, Conn., and will be associated with the Robbins, Gamwell Co., Pittsfield, Mass., on March 1.

FRED W. FREEMAN has been named as general western manager of the Texas Co. and H. W. DODGE has been appointed western sales manager.

JOHN MCELGIN, formerly superintendent of the Carthage Sulphite Pulp and Paper Co., is now associated with the Macon Iron Works, Macon, Ga., in an executive capacity.

G. M. LESLIE, treasurer of the Bass Foundry and Machine Co. and the Fort Wayne Foundry and Machine Co., both of Fort Wayne, Ind., has been elected president of both companies to succeed the late John H. Bass. C. T. STRAWBRIDGE will continue as vice president and L. HEELY LINK as secretary of the Bass Co.

ERNEST BLATTMAN, president of the Schroeder-Blattman Co., New Orleans, La., and ARTHUR J. WEESER, shop superintendent, have acquired of the plant which will be known hereafter as the Blattman-Weeser Sheet Metal Works.

M. T. LUTHER has been placed in charge of the new office of the Foster Machine Co., 522 Machinery Building, Chicago.

EUGENE A. BASLEY, a member of the American Society of Civil Engineers, and ALBERT E. FISK, a member of the Western Society of Engineers, have become associated under the firm name of Basley and Fisk for the purpose of engaging in a general consulting engineering practice. Their offices are at Room 920, 30 North La Salle St., Chicago.

W. EARL PARENT, formerly mechanical engineer for the Miller Lock Co.; WILLIAM A. PARENT, formerly general manager of the Dexter Metal Manufacturing Co. and WALTER M. CONARD, formerly secretary and purchasing agent for the Miller Lock Co., have announced their association in a partnership, to be known as the Par-Con Co., Ltd., with offices in the Bourse Building, Philadelphia.

A. E. ENSELL, until recently with the Equipment Corp. of America, is now engaged in the purchase, sale and rental of general contractor's equipment. He is located at 1628 Market St., Philadelphia.

HARRY E. HARRIS of Hubbard, Harris & Rowell, Inc., Bridgeport, Conn., has taken over the activities of the concern. The business will be known in the future under the name, Harry E. Harris Consulting Engineer.

Obituary

DANIEL REEVES, president of the Phoenix Iron Co., Phoenixville, Pa., died at his home recently at the age of 70 years. Mr. Reeves recently suffered an attack of heart disease at his office in Philadelphia and since that time has been confined to his home. He had been president of the Phoenix Iron Co. for the past thirty-four years when he succeeded his father, the late Samuel J. Reeves, who had in turn succeeded his father, David Reeves, the founder of the company. Mr. Reeves was also the president of the Phoenix Bridge Co., a subsidiary of the iron company and was a director of the Cambria Iron Co., and the Pennsylvania Traffic Co.

OSCAR E. PERRIGO died recently at his home, Hartford, Conn. Mr. Perrigo was a mechanical engineer and a frequent contributor to the *American Machinist*. For the past six years he has been employed by Pratt & Whitney Co. of Hartford and was well known among mechanical engineers of the East. He is survived by his wife and two sisters.

A. H. BAUMAN, vice-president of the Cleveland Duplex Machinery Co., Inc., Cleveland, Ohio, died recently at the age of 32 years. Mr. Bauman was born in Fremont, Ohio, and after being graduated from high school he served an apprenticeship in the shops of the Lake Shore Electric Co., Fremont, and later came to Cleveland where he was employed by the White Motor Co., as a tool maker. During the war he was general foreman of the Gun Shop of the American Brake Shoe Co., Erie, Pa.

J. M. CARPENTER, president of the J. M. Carpenter Tap and Die Co., Pawtucket, R. I., died on Friday, Jan. 24.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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ATLANTA, GA.

ON MY WAY through the south Atlantic states of the Mississippi Valley and the middle west, I have had opportunity to interview many men of large affairs. A feeling of optimism is general. In the cotton states the cheerfulness is of course partially due to the good prices at which cotton is selling, but it also reflects a belief in the general prosperity of the country and the confident hope that business will not soon again be run through the wringer of deflation, in which it was so painfully squeezed two years ago. In so far as Europe and the Near East is concerned, there is an academic interest in the perplexing problems that vex statesmen overseas, but they are not regarded as out problems, nor are they included in the calculations of many practical business men.

The unreality of Europe for Americans is both our safety and our danger. It insures us against unnecessary alarm when the strategy of European statesmen leads them to threaten the declaration of an unintended war, but it may lull us into a feeling of mistaken security from which we may be suddenly awakened when we find that there is no longer any transatlantic demand for the surplus production that we formerly sold to France and Germany as well as to the other continental peoples whose buying power is now being diminished as the area of unrest grows wider.

For these reasons conservatism still seems to be advisable, although it is to be admitted that internally the United States is probably in a better position than it has been at any time since we entered the war in April, 1917. This is especially true of our banking position for, while there are a few frozen loans left, most of the credits that had been congealed are liquified and most merchants and manufacturers are able to obtain all the accommodation required for the conduct of a normal and expanding business.

The reserve ratio of the Federal Reserve system advanced again last week to 77 per cent, the slight rise being due to a decline in bills discounted, as gold holdings changed but little from the previous week. A significant characteristic of most bank statements, however, is that commercial loans increased during the month of January, which is almost unprecedented, and which is indubitable evidence of continuing activity in production and trade through what is normally a dull season. This is attested to also by the volume of freight loaded by the railroads, which is breaking all records for this time of year, and by the increasing complaint of scarcity of labor, which began with manufacturers and is now extending to employers of clerical help in the larger cities.

Of the farmer it may be said that his position is more commanding than at any time previously in the history of the country. Through his representation in Congress and in the State Legislature he has become able to insist upon almost anything that the government can give him and through his co-operative marketing organizations he has made great progress in solving his economic problems. This is well, and provided he does not abuse the new found power of which he is becoming conscious, the farmer's self-confidence will probably go a long way to insuring the permanence of the prosperity that is now to be observed. This self-confidence as it spreads is pervading all classes and one of its effects in the South has been to check the negro migration of which so much has recently been said in the newspapers. In this section, at least, there is work at good wages for everyone who is industrious and the negro is not disposed to leave the South when he can make a good living.

"A significant characteristic of most bank statements, however, is that commercial loans increased during the month of January, which is almost unprecedented, and which is indubitable evidence of continuing activity in production and trade through what is normally a dull season. This is attested to also by the volume of freight loaded by railroads which is breaking all records for this time of the year, and by the increasing complaint of the scarcity of labor."

Everything in the market news seems to indicate that the general belief in prosperity would be justified if prosperity could indeed be measured by the course of prices. Sugar has had a sensational advance of three quarters of a cent a pound within five days because a good many think there is a possibility of scarcity and higher prices in the autumn. As usually happens the rush to "get in" on the advancing market will probably carry it too high. Coffee has again made new high levels, principally because stocks were allowed to run dangerously low. Wool continues its monotonous advance, which singularly enough never seems to be relieved by a decline. We are assured that as a result clothing will cost $5 more a suit this year. Crude oil and its products are advancing, despite record production, because 1923 is expected to be the greatest automobile year in our history. The makers of tires, most kaleidoscopic of American industries, expect to turn out the hitherto unheard of total of 55,000,000 this year. Steel is higher and strong; the mills are as near the theoretical capacity as they ever get and even so have little to spare for export. Lumber and other building material are extremely active and advancing and an enormous volume of building projects is reported from all sections. Reports from the farm implement makers are more optimistic, and the manufacturers of railway equipment are sharing the increased earnings of the roads.

Buyers are flocking into New York at a rate perhaps never before equalled. I am even told that some of the large middle western distributive organizations have chartered special trains to bring their representatives to the city.

This is a truly impressive array of bullish facts, and it is not surprising that the stock market, contemplating them, has been impervious to the threat contained in the European situation. It would be difficult to select any group of stocks in which a decline would appear logical, for independent of outside influences each class is held up by the glowing reports which come from the industry which it represents; there are practically no exceptions. Behind all, of course, is the consciousness of an abundant supply of credit and the encouragement to venturesomeness which it lends. The bond market, which might also be expected to reflect this, is digesting its recent surfeit of new issues and is consequently quiet though Liberties have advanced because British buying in accordance with the provisions of the debt agreement is expected to prevent them from dropping much below par.

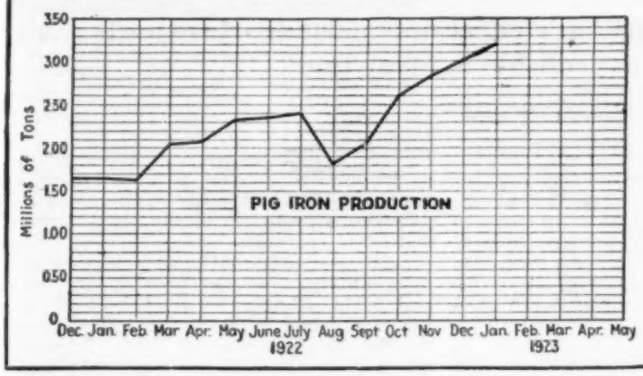
Optimism is, in fact, evident everywhere, and it is a distasteful task for one who naturally shares it to repeat the warning that trees never grow to the sky, that economic well being is not the result of advancing prices, but of their equitable relationship, and that price advances which are not spread equitably over all commodities and offset by wage advances will not produce genuine prosperity.

The danger that the present promise of prosperity will prove to be fictitious is not immediate. One of the salutary factors in the outlook is the improbability that distributors will lay in as heavy stocks at the top of the markets as they did during 1919. But it should be evident from the lessons of that year that a continued advance in prices, probable though it is, is to be feared rather than welcomed.

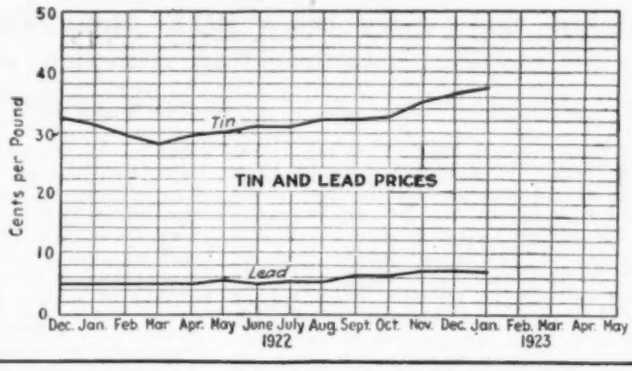
Electric Power Club Meeting

The next annual meeting of the Electric Power Club will be held on June 11 to 14 inclusive at the Homestead, Hot Springs, Va., where the association was organized in 1908. It is expected that a considerable amount of important standardization of electric power apparatus will be effected.

Monthly pig iron production of all coke and anthracite furnaces in millions of tons, based on returns compiled by the American Iron and Steel Institute.



Monthly average price of tin and lead in the New York market, based on returns furnished by Engineering and Mining Journal-Press.



PIG Iron Production during January and December has been increasing and reports from various centers would indicate that during the next six months record figures will be given out in this line. During the past few weeks reports of sales of Canadian pig iron to Philadelphia customers have been made but it is further stated that these were in small quantities and that the quality was not good as the domestic iron to be had from American centers. Prices are firmly established at around $27. Orders are expected to be heavy during the first part of March as consumers will be buying for use in the second quarter of the year.

Export of Metal Working Machinery took a sudden upturn in December. The total value of such exports, according to returns to the Bureau of Foreign and Domestic Commerce, was $1,362,376 which was an increase of $435,383 over the value of exports in November and an increase of nearly $600,000 over the exports of December, 1921. The principal increases are in the number of lathes, boring, drilling, polishing, sharpening and grinding machines. Of the total amount, $106,818 was spent for lathes, $100,391 for sharpening and drilling machines, $79,386 for planers, shapers and slotters, and $77,139 for reamers, cutters, drills and other parts for machine tools. The Ruhr Occupation is having some effect upon the exporting of tools and Germany's inability to deliver orders on time is temporarily helping American manufacturers and exporters of machine tools. It is predicted that during the next few months exceptional business in exporting will be experienced.

Comparative Prices of Shop Supplies

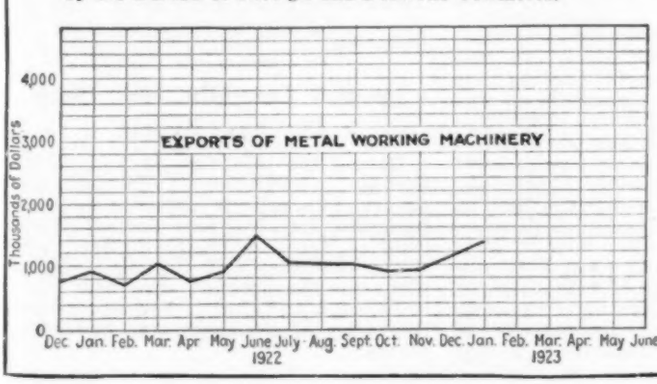
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0303	$0.0296	$0.0247
Cold finished shafting	per lb.	0.0383	0.0378	0.0336
Brass rods	per lb.	0.1766	0.1742	0.155
Solder (½ and ½)	per lb.	0.2538	0.2425	0.2125
Cotton waste	per lb.	0.1181	0.1175	0.1315
Washers, cast iron (½ in.)	per 100 lb.	4.33	4.33	3.83
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	2.96	2.96	3.11
Lard cutting oil	per gal.	0.575	0.5583	0.65
Machine oil	per gal.	0.349	0.36	0.45
Belting, leather, medium	off list	49%	49%	49⅞%
Machine bolts up to 1 x 30 in.	off list	51⅛%	51⅛%	63%

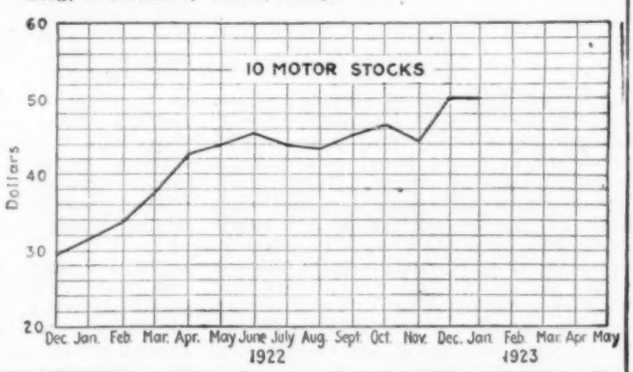
Tin and Lead Prices have shown some little change during the month but for the most part the average shows a normal fluctuation only. Tin is in demand, but the quantity seems to be ample and, while prices are at a high level at the present time, predictions are that it will not go much higher. There is a steady flow of tin from the Malay Straits sent to this country in small but regular quantities. Lead has remained at an even level for some time past and authorities in this line do not look for any radical change within the next few months.

Ten Motor Stocks that have been averaged each month show by the chart below a remarkably steady performance during the past month. After a decided upward curve of a month ago, the level at 50 has been maintained and indications are that while there may be further rises during the Spring, nothing of an alarming nature will be experienced. The big fluctuations in motor stocks have been in those of a speculative nature and not included in the average shown on this page. Interest among speculators have centered about the regular motor sensations which from time to time attract the attention of Wall Street, and after violent and frequent changes up and down disappear or fall to a low level from which they do not recover.

Total value of all metal working machinery exported monthly from the United States, based on returns compiled by the Bureau of Foreign and Domestic Commerce.



Average price of ten automotive stocks: Chandler, General Motors, Hupp, Mack Trucks, Pierce, Stewart, Stromberg, Studebaker, White, Willys.



British Industry Improving Slightly

Machine tool exports below 1921—Ruhr occupation's effect on England—Re-exports a big factor—Wage reductions seem probable in many lines

BY OUR LONDON CORRESPONDENT

THE ACCOMPANYING tables relating to overseas trading have been prepared directly from a return supplied by the British Board of Trade to the European edition of this journal. As far as they go they may be left to speak for themselves. But it may be well to mention that, taking weights only, the exports of British machine tools last year were considerably below those of the pre-war period and even below war-time figures, amounting, in fact, to little more than half the maximum of 1920. On the other hand, although considering recent figures imports of machine tools registered were relatively low in weight, they were at least up to pre-war average, but of course at nothing like war level.

The values per ton of export declined somewhat, but the lower weight value is much more pronounced in the case of the imports, which are now practically equal in this respect to the exports. Formerly, British machine tools on the weight basis were of about two-thirds the money value of the corresponding imports. It will be seen that re-exports, that is, exports of foreign-made machine tools, remain a relatively small item and, as usual, the value per ton is quite beyond what would be expected from figures, whether of imports or exports. Of British exports, lathes and drilling machines are the most prominent—as usual—and both here and in the imports and re-exports the miscellaneous entry forms a large proportion of the whole.

IMPORTS

Machine Tools (Metal-working)	Quantity Tons	Value £	£ per Ton
Drilling	562	57,503	102
Grinding	256	41,734	163
Lathes	854	78,865	92
Milling	295	35,979	122
Planing and shaping	261	23,888	91
Presses, punching and shearing	466	54,330	116
Other	591	104,682	178
Parts (chucks and other work-holders)	100	26,523	265
	3,385	423,504	125

EXPORTS

Machine Tools (Metal-working)	Quantity Tons	Value £	£ per Ton
Drilling	1,936	284,991	147
Grinding	618	99,521	161
Lathes	3,320	421,973	127
Milling	638	90,050	141
Planing and shaping	1,368	131,947	96
Presses, punching and shearing	629	75,904	120
Other	3,627	413,442	114
Parts (chucks and other work-holders)	31	12,983	419
	12,167	1,530,811	126

The condition of the machine tool industry has improved perhaps of late, though only three or four firms can be described as fairly busy; others have, however, been receiving a few orders. But business generally has been set back by the happenings on the continent, and once more a demonstration has been given of the essential oneness of the world. The overseas orders that have been noted of late show that the British dominions are still equipping their shops, and India, for railway and other work, has proved a good friend.

Further, one or two recent auction sales of machine tools suggest that the knock-down price period has passed away. In fact, until the continental complications occurred the machine tool prospects were certainly brighter and a number of serious inquiries were sent out. But taking things as they are competition is keen, and the writer knows of a firm who, quoting for a lathe, at £3,000, knocked off £200 and then found that they were but one of three firms at the same price. In another case a firm quoting for a planer put forward their cheapest line, trimmed their price, and then were the highest of eight. Indeed, it has been publicly stated by Ernest Parkinson, of the well-known Shipley firm, that "at the present time there is scarcely a machine tool maker in this country who is not losing money on every machine he sells."

RE-EXPORTS

Machine Tools (Metal-working)	Quantity Tons	Value £	£ per Ton
Drilling	29	8,260	285
Grinding	24	4,762	198
Lathes	34	5,670	167
Milling	29	2,967	102
Planing and shaping	3	698	233
Presses, punching and shearing	...	...	...
Other	35	10,471	299
Parts (chucks and other work-holders)	6	2,888	481
	160	35,716	223

This does not apply only to machine tools, and complaints have been frequent as regards price-cutting on milling cutters and other small tools. When it was suggested that in Sheffield last year the loss for this reason on orders executed for files reached £100,000, the only criticism related to the lowness of the figure. Prices are now higher.

The engineering industry, in fact, last year went through a particularly trying period and the estimated loss in the motor car industry alone has been put at £15,000,000. The automobile firms that made a profit could probably be easily counted on the fingers of two hands.

Imports Show Decrease

Turning to a larger field, looked at from the point of view of balance of trade, the figures for overseas trading last year were rather more satisfactory, for, while exports increased somewhat, imports decreased still more. In fact our adverse trade balance, adverse that is as regards visible goods, etc., has steadily decreased for the past five years and approaches pre-war figures. Imports were valued at nearly 1,004 million pounds, with exports at 720½ million pounds, and re-exports, that is, exported foreign and colonial produce, at more than 103¾ million pounds, leaving a difference of less than 179¾ million pounds. Imports of manufactured goods showed a decline and of raw materials an increase. In exports of British produce, manufactures as a class showed a definite decline, although as a proportion of the total of British exports they remain about the same as pre-war: raw material sent out showed a definite increase.

Last year apparently we produced approximately 4,900,000 tons of pig iron and 5,832,000 tons of steel, both showing a marked increase on 1921, but a decline on the levels of 1913. Exports of machinery weighed 403,000 tons, which is but four-fifths of the 1921 level and less than two-thirds of the 1913 level, while locomotives exported weighed about 32,000 tons, or three-quarters the usual amount, and exported motor-cycles numbered about 7,000, plus about 68,000 ordinary cycles, the latter being a great advance on 1921, although neither figure is equal to half the corresponding 1913 figure.

The Reduction of Wages

The movement continues towards a reduction in wages rates, and teachers, both in the elementary and secondary schools, have, under pressure, "voluntarily" agreed to a reduction of five per cent. It is, of course, the workers in industries naturally protected against overseas competition who have countered most successfully any such action. To judge by conversations, there is no movement for further reduction in the engineering trades, the change, if most employers had their way, being more likely to occur in the opposite direction. The building trades, amongst manual workers, can be included among those that have resisted change most successfully, and in view of the cost of building the employing side too appear to be definitely attempting to effect both a considerable reduction in wages and also a lengthening of the working week, where the building trades are specially favored by comparison with other workers. It is, in fact, on the question of hours that workers of all kinds are most likely to unite in resistance. Meanwhile, after rising rapidly, in fact suddenly, to near the 1½ million mark, the numbers of persons recorded on the live registers of the unemployment exchanges in Great Britain as wholly unemployed has shown a tendency to decline and is at the moment 1,458,600. The cost of living as officially computed has come down and is again rated at 78 per cent above pre-war figures: but the basis of calculation, or at least its application, is being assailed from all directions.

Jones & Laughlin, Inc., Deny Purchase Report

During the past few days, a report that the Inland Steel Co., Chicago, was prepared to sell its plant to Jones & Laughlin, Inc., has been denied by officials of Jones & Laughlin, Inc., who stated that they had already made all plans for the erection of a new plant in Chicago and that it had never been the policy of the concern to buy other plants.

Book Reviews

Oxy-Acetylene Welding and Cutting. By P. F. Willis. Sixth edition, revised and enlarged. Green cloth-board covers, 4x6 in., 254 pages, 99 illustrations. Published by the Norman W. Henley Publishing Co., 2 West 45th St., New York, N. Y. Price, $1.50.

Information on oxy-acetylene welding for both the experienced welder and the beginner is contained in the book. The material is of a practical nature so as to aid the operator on the work to the greatest extent; it is sufficiently comprehensive to cover the problems ordinarily encountered. The pocket size of the volume makes it necessary that the treatment of the subjects be concise.

The properties, methods of handling and peculiarities of the gases acetylene and oxygen are treated at the beginning of the book. Welding and cutting torches and the apparatus used in welding are described and the characteristics of different types explained. Most of the treatment of the subjects up to this point is in the form of a catechism. After the manner of preparing the work for welding and of pre-heating has been covered, the procedure of welding various metals and types of work is described. Special attention is given to welding sheet metal, pipe, boilers of different types, and a variety of automobile parts. After a short chapter on the symbols used in describing welding, a chapter on electric welding is given, to cover the general features and method of procedure in such welding.

The problems of both the repair man and the manufacturer are considered, and the scope of the book is such that information on both light and heavy welding is given. The book should serve as a practical handbook and reference work for those engaged in welding.

Trade Catalogs

Milling Machines. The Ingersoll Milling Machine Co., Rockford, Ill. This concern has recently issued a short descriptive folder of it's inserted tooth cutters, also a one hundred-ton milling machine.

Steel Tools. Edgar T. Wards Sons Co., Boston. A profusely illustrated 92 page catalog has been issued by this company. Included in the contents are products of cold rolled or drawn steel, spring steel, sheet steel, steel tubing and tool steel.

Jacks. Weaver Mfg. Co., Springfield, Ill. The Weaver "New-Way" Jack, model B, is described and illustrated in a folder issued by the company.

Welding and Cutting Apparatus. The Alexander Milburn Co., 1416-1426 W. Baltimore St., Baltimore, Md. Regulators, generators, gages and torches are listed in this booklet.

Grinders. Hardinge Company, 120 Broadway, New York City. Catalog No. 13, section 1, has been issued by this company. The catalog is exceptionally well illustrated and deals with the theory of grinding, materials ground and operation of the Hardinge mill.

Moulding Machines. The Osborn Mfg. Co., Inc., Cleveland, Ohio. Moulding machines are fully described and the processes of manufacturing are clearly shown in this catalog.

Cranes. Whiting Corporation, Harvey, Ill. The catalog of this concern has just been issued and contains a list of parts, diagrammed and illustrated.

Machine Tools. The Porter-Cable Machine Tool Co., Syracuse, N. Y. The latest catalog to be issued by this company covers its line of sanders, grinders and band saws. The illustrations are plentiful.

Portable Electrical Drills. The Cincinnati Electrical Tool Co., Cincinnati, Ohio. In the latest Catalog of this company are described portable electrical drills for numerous purposes, grinders and buffers.

Foundry Equipment. J. W. Paxson Co., Philadelphia, Pa. Cupolas are shown in the folder issued recently. The complete line is also mentioned.

Ball Bearings. The New Departure Mfg. Co., Bristol, Conn. The importance of ball bearings to gears is treated in the folder sent out by the company.

Tachographs. O. Zernickow, 15 Park Row, N. Y. The principles and working instructions are explained in the folder. Illustrations and charts are shown.

Lathes. Oliver Machinery Co., Grand Rapids, Mich. The text and illustrations give a good description of motor head speed lathes.

Cylinder Machines. Storm Mfg. Co., Minneapolis, Minn. The cylinder stormizing machines for boring, grinding and honing are explained. Illustrations accompany the text.

Gear Speed Reducers. W. A. Jones Foundry and Machine Co., Chicago. The catalog recently issued by this company deals with the problem of speed reduction in general and the application of Jones Spur Gear Reducers in particular. There are 27 pages of views of installations, likewise instructions for installing and operation.

Auto Cranes. The new folder of the Weaver Mfg. Co., Springfield, Ill., presents its auto crane in an attractive manner. Illustrations accompany the text.

Presses. Adriance Machine Works, Inc., Brooklyn. A catalog containing descriptions and illustrations of several types of double action cam presses has recently been issued to the trade.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Apparatus for making ice cream in small quantities without the use of ice—Spain. Purchase. Reference No. 5246.

Machinery for wrapping paper and for making chalk for school supplies—Guatemala. Purchase. Quotations, c.i.f. Puerto Barrios or San Jose, Guatemala. Terms: Cash against documents. Correspondence, Spanish. Reference No. 5248.

Equipment for a small gold-mining plant to cost about $15,000, including hoist, air compressor, drills, and four motors of various sizes—Canada. Purchase. Quotations, f.o.b. shipping point. Reference No. 5251.

Lathes, suitable for metal-working industries—Italy. Agency. Quotations, c.i.f. Italian port. Terms: Cash against documents. Reference No. 5262.

Printing types and machinery—Ceylon. Purchase. Quotations, c.i.f. Colombo. Samples and price lists desired. Reference No. 5284.

Electrical devices or appliances—Canada. Exclusive agency. Quotations, f.o.b. Toronto. Reference No. 5290.

Machine for the reconditioning of worn and flattened electric car wheels—Spain. Purchase. Quotations, c.i.f. Spanish port. Terms: Cash against delivery. Correspondence, Spanish or French. Reference No. 5276.

Machinery and tools for wood and metal-working, such as lathes, shapers, planers and milling machines. Poland. Agency. Quotations, c.i.f. Danzig. Correspondence, French or German. Reference No. 5281.

Machines for metal-working, such as lathes, planers, milling machines, drills and screw and bolt threaders; and machines for woodworking, such as lathes, planers, lumber-mill equipment, stump-pullers, and logging machinery. Poland. Agency. Quotations, c.i.f. Danzig. Reference No. 5292.

Woodworking machinery, including cooperage machinery. Switzerland. Agency. Correspondence, French or German. Reference No. 5293.

Mine trucks and cars and cane trucks—South Africa. Agency. Quotations, c.i.f. South African ports. Reference No. 5295.

Base-burner stove castings, unnickeled, with firebox 12 by 18 inches. Czechoslovakia. Purchase. Quotations, c.i.f. German, French, or Holland ports. Terms: Cash against documents. Reference No. 5306.

A 1 ton and a 1½ ton ice-manufacturing machine, and a water distilling machine for capacity of 1 and 1½ ton ice plant. Mexico. Purchase. Quotations, c.i.f. Mexican port. Terms: Payment against documents. Correspondence, Spanish. Reference No. 5309.

Machine tools, construction machinery for building roads, dams, and railroads, and mining machinery. Norway. Agency. Reference No. 5313.

New inventions in machinery and electrical novelties. Switzerland. Agency. Correspondence, French or German. Reference No. 5314.

Sheet iron and all kinds of special industrial machinery. Austria. Agency. Quotations, f.o.b. New York. Reference No. 5318.

Tire setting machine for affixing metal tires on wagon wheels without heating tires. Canada. Purchase. Quotations, f.o.b. port of shipment. Reference No. 5322.

Machinery for knitting football stockings. India. Purchase. Reference No. 5324.

Printing machinery of all kinds, suitable for manufacturing stationer and general printer. New Zealand. Purchase. Quotations, c.i.f. New Zealand port with f.o.b. price for customs purposes. Terms: cash against documents at port of delivery. Reference No. 5120.

Pension Fund Report

According to the pension fund report of the United States Steel Corporation and the Carnegie Steel Co., since Jan. 1, 1923, there has been paid out in pensions $8,095,122. During the past year there was paid out $1,266,661 in pensions to 745 employees, bringing the total number of beneficiaries up to 3,437 since the fund was started.

Forthcoming Meetings

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies' Bldg., New York. F. L. Hutchinson, Secretary.

American Society for Steel Treating, Winter Sectional Meeting, City Club, Chicago, Ill., February 8 and 9, 1923. National Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers. Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

Philadelphia A.S.M.E. and **Philadelphia A.I.E.E.**, Joint meeting February 27 at the Philadelphia Engineers Club. Afternoon, dinner and evening sessions. Louis H. Kenney, Meetings committee, U. S. Navy Yard, Philadelphia, Pa.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Gear Manufacturers' Association. Seventh annual meeting April 19, 20 and 21, Hotel Cleveland, Cleveland, Ohio.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., April 25 to 27, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

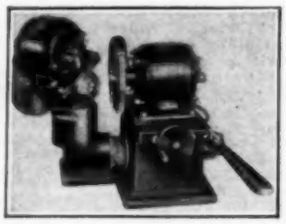
National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Condensed-Clipping Index of Equipment

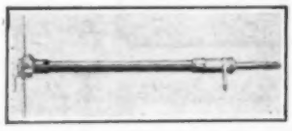
Patented Aug. 20, 1918

Grinding Machine, Valve and Reamer, Electric
Fleming Machine Co., Springfield, Mass.
"American Machinist," December 21, 1922



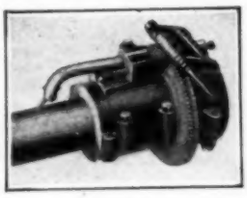
The machine is for grinding the valves of automotive engines, and for grinding the valve seating reamers used in connection with them. A ¼-hp ball-bearing motor is mounted upon a slide rest having screw-adjusted movement in one direction and a hand-lever-operated movement in the other, and it drives a 6 x ¾ in. grinding wheel at a peripheral speed of 5,200 ft. per minute. A 1/20-hp. motor upon the swiveling work head drives the work spindle through speed-reduction gearing. The work is held in spring collets having a maximum capacity of ⅝ in. round. Due to the swivelling work head any valve of a commercial engine may be ground. Valve-seating reamers and the corresponding valves may be ground without disturbing the setting. Weight, 100 pounds.

Rivet Cutter, Pneumatic, "Boyer Superior"
Chicago Pneumatic Tool Co., New York, N. Y.
"American Machinist," December 21, 1922



The tool consists of a dead handle for holding the machine, a throttle handle of the crank design, a throttle valve of the taper type, a back head screwed onto the cylinder and secured by a locking device, a cushion chamber in the rear end of the cylinder, a cylinder of seamless steel tubing, a bypass from back to front head, a non-removable electrically welded front head, square coiled spring buffer, adjustable chisel lock, hand hold of the spade handle type, and a chisel. To operate the cutter, the throttle handle is moved in a line parallel with the cylinder. Each forward and return stroke of the piston is hand controlled. Two men are needed to operate the machine.

Truing Device for Journals of Locomotive Axles
C. E. Marsh, 324 Hemphill Ave., Atlanta, Ga.
"American Machinist," December 21, 1922

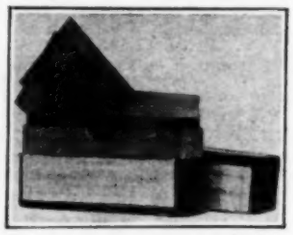


The device, including the worm wheel, is made in halves so that it can be clamped above the axle. At one end of the worm shaft is a standard taper shank by which the device may be driven from an air drill or electric motor fitted with a taper socket. The cutting tool is inserted in the worm arm and may be made of any kind of steel or of any shape. The block carrying the tool arm is fitted to a dovetail slide and the feed is by a screw. Three changes of feed in either direction are provided. The device is portable and its use obviates the necessity of swinging an axle with its wheels into a driving wheel lathe to true the journals.

Riveting Machine, Dual-Head, Electric, Types NB and NC
Kobert Machine Co., Inc., 50 Church St., New York, N. Y.
"American Machinist," Dec. 28, 1922

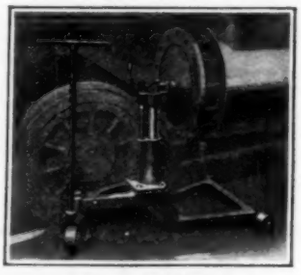
The machine has been redesigned. A copper electrode is placed on the right, and a steel heading set on the left. The rivet is heated by passing a current through it when resting on the horn and held down by the copper electrode. When the heat has progressed sufficiently, the head is moved laterally 1¼ in. to bring the steel heading set or ram over the work, which does not change its position. The head of the rivet is then formed under pressure. The machine is motor-driven to provide the necessary pressure on the work, and is controlled by one pedal. A spring-loaded device prevents excessive pressure. The electrode does not make or break contact with the work while the current is on. The Type-NB machine is for use on rivets from ¼ to ½ in. in diameter, and the Type-NC machine for rivets from ½ to ¾ in. in diameter.

Shims, Brass
Thinsheet Metals Co., Waterbury, Conn.
"American Machinist," December 21, 1922



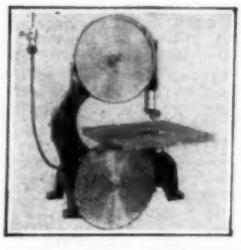
Each box contains 150 sheets 2 x 4 in. in size, with three thicknesses of 0.001, 0.002 and 0.003 in. The different sizes are separated in the box, so that they can be easily reached. The size of the box makes it suitable for use at the bench or in a tool kit to be carried to the job. The small sheets are more convenient to use than where it is necessary to cut shims from a large sheet. The sheets are preferable in some respects to strip metal, which is not always convenient for the reason that rolls of brass of various thicknesses are not generally available at each bench and cannot well be carried to repair jobs away from the shop.

Crane, Cylinder-Head, Portable, "Viloco"
Harry Vissering & Co., Chicago, Ill.
"American Machinist," December 21, 1922



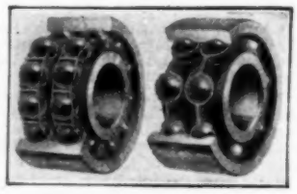
The crane is for use in the removal and replacement of locomotive cylinder heads and crossheads, being suitable for all classes of locomotives. The frame of the truck, which provides a center distance of 32½ in. between the front and rear wheels and of 21 in. between the rear wheels, carries a vertical steel column to which the cylinder head can be secured. By means of a lever at the top of the column, the screw can be turned to vary the height of the head. The maximum height of the bolt carrying the work is 36 in. above the floor. The weight of the truck keeps the steering handle in a vertical position when the truck is not being pulled. Lowering the handle slightly raises the truck frame.

Sawing Machine, Band, Bench, Electric
Benjamin E. Jarvis, Inc., Newark, N. J.
"American Machinist," December 21, 1922



The machine is of a portable type. The saw bands are of a flexible, Swedish steel. The wheels are 12 in. in diameter, 1-in. face, made of steel and mounted on ball bearings. The upper and lower guides are of the roller type and the rolls revolve on hardened centers. The capacity of the machine is for 2-in. wood, either hard or soft. Saw bands can be supplied for cutting thin brass and soft metals. Current for driving the ¼-hp. motor may be supplied from a lighting circuit. The motor is controlled by means of a pushbutton switch located on the frame of the machine. Table, 13½ in. x 15 in.; can be tilted. Height, 28 in. Weight, 120 pounds.

Bearings, Ball, Radial, Double-Row
U. S. Ball Bearing Manufacturing Co., 4535 Palmer St., Chicago, Ill.
"American Machinist," Dec. 28, 1922



Two types of bearings are furnished, the standard, shown at the right, and the maximum, which contains more balls than the standard type, at the left. One of the principal features of the bearing is the construction of the retainers. Independent riveted retainers are employed for each row of balls, so that the same strength is obtained in each retainer as in the single-row type of bearing. The bearings are stated to be especially adaptable for installations requiring large bearing capacity in a limited amount of space. Although intended primarily for carrying heavy radial loads, a thrust load of 25 per cent of the maximum radial load can also be withstood. The maximum-type bearings have capacities 25 per cent greater than the standard type. The bearings are made in a range of sizes from 10 to 110 mm. bore (0.394 to 4.330 inches.)

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Conn., Hartford—Pratt & Cady Co., 556 Capitol Ave., (manufacturer of valves and steam supplies), F. A. Brezina, Purch. Agt. —several tools, etc.

Conn., New Haven — Kilborn & Bishop Co., Chapel and Lloyd Sts., H. Kilborn, Vice Pres.—double disc grinder with one movable head.

Del., Dover — A. F. Wolke, c/o United States Corp. Co., South State St.—$25,000 worth of machinery, including lathes, drills, presses and generators for the manufacture of storage batteries.

Ill., Chicago—Atchison, Topeka & Santa Fe Ry., 80 East Jackson Blvd., M. J. Collins, Genl. Purch. Agt.—equipment for proposed shops at Emporia, Kan.

Ill., Chicago—Interstate Iron & Steel Co., 104 South Michigan Ave.—One Bradley hammer, 1,000 lb. capacity.

Ind., Hammond—P. H. Mueller, 789 Hohman St.—sheet metal working machinery.

Ind., South Bend—I. W. Macy, 1150 Portage Ave.—one 26 or 30 in. lathe; one radial drill; one single spindle drill press, medium size; one punch for ⅝ in. hole in ½ in. stock or heavier one shear for ½ in. stock 6 in. wide; one grinder.

Mich., Detroit — General Aluminum & Brass Mfg. Co., 5212 East Grand Blvd., (aluminum and brass castings)—portable alligator shear, 2½ in. round capacity; one 36 x 46 New Haven sandblast barrel or equivalent, one 36 in. bandsaw, Crescent preferred.

Miss., Meridian—S. W. Kendall—machine shop equipment and machinery for the manufacture of cement, for plant at Sheffield, Ala.

N. Y., Adams—Greenley Machine Co., (machine shop), D. R. Greenley, Purch. Agt. —milling cutters, ⅛ to 1⅛ in. H. S. twist drills and tool holders.

N. Y., Adams Center—G. J. Davis Co., Main St., (machine shop, sheet metal and steam heating)—pipe cutting and threading machine.

N. Y., Adams Center—S. Dibble Co., (machine repairs and woodworking)—one electric portable drill; one portable forge with blower; H. S. drills.

N. Y., Buffalo—W. A. Riley, 1146 Niagara St.—equipment for service station, including 500 gal. gasoline tank and pump.

N. Y., Clayton—F. I. Daily, Mary St., (bus line)—drill press suitable for motor and truck repair (new or used).

N. Y., Henderson Harbor—James Bassett Co., (manufacturer of boats)—sheet metal working machinery.

N. Y., New York—Alfred Field & Co., Inc., 93 Chambers St., (importers and exporters), G. Wander, Purch. Agt. — one solid, strong, modern lathe, capable of cutting bar 6 in. in diameter, 15 ft. long, no attachment except simple and effective arrangement for cutting conical threads; one pneumatic or power hammer capable of welding 5 in. bar; one automatic saw for cutting bars and pipes up to 8 in. (motor driven).

O., Elyria — Superior Metal Products—metal working machinery.

Okla., Ardmore — Brooks Burner Stove Co., (manufacturer of gas ranges, etc.)—machine shop and foundry equipment, to replace that which was destroyed by fire.

Pa., Annville—Lloyd Mfg. Co., (manufacturer of drop forgings, turnbuckles, etc.) —forge shop equipment, including presses, drills, etc.

Pa., Wellsboro—O. H. Evans Co.—machinery, tools and equipment for garage.

Pa., Wilkes-Barre—Wilkes-Barre Iron & Wire Wks., Inc., Coal Exch. Bldg., J. S. Wilson, Mgr.—air compressor, drill press, cold saw punches, shear and crane.

Tenn., Athens — E. L. Wilson — machine shop and foundry equipment.

Tenn., Nashville — Tennessee Central R.R., 319 7th Ave., N., J. E. Toms, Purch. Agt.—$50,000 worth of machine shop equipment.

Wis., Eau Claire—K. M. Knudson, 107 North Farwell St.—equipment, including forges and power machinery, for proposed machine shop.

Wis., Kenosha—North Side Garage, W. Russel, Mgr.—automobile repair machinery for proposed $40,000 garage.

Wis., Madison—Wisconsin Truck Co., 1710 Adams St., C. W. Keniston, Mgr.—machinery and tools for assembling motor trucks.

Wis., Milwaukee—Auto Service Station, 5225 Greenfield Ave.—20 to 22 in. drill press, small grinder and medium size lathe.

Wis., Milwaukee—Industrial Appliance Mfg. Co., c/o A. E. Ohrmundt, 1584 10th St., (manufacturer of accessories for tractors)—lathe for medium duty, drill press about 20 in. and motors.

Wis., Milwaukee—Lakeside Garage Co., 33 Patton Bldg.—repair machinery for proposed $250,000 garage.

Wis., Milwaukee — J. P. Meehan, 266 27th St. (garage)—22 in. drill press and lathe, about 6 ft.

Wis., Rice Lake—Ford Garage—drill press, air compressor and grinder.

Wis., Waupun—Waupun General Repair Shop, H. Erdman, Mgr.—machinery and equipment for general repair and machine shop.

Que., Montreal—Crammond Machine Co., 169 St. Ferdinand St.—small lathe.

Machinery Wanted

Ala., Haleyville—C. Tubb—machinery for small overall factory and hosiery mill.

Calif., Martinez—Bay Point Box & Mfg. Co.—box making machinery and equipment.

Conn., Unionville—J. Broadbent & Son, Inc., (cotton yarns and batting)—one 500 or 1,000 lb. Franklin process dyeing machine for dyeing cotton yarn on tubes.

Conn., Wallingford—R. Wallace & Sons Mfg. Co., (silver cutlery and plated ware), address Purch. Dept.—No. 133 or No. 137 type Thomson spot welder.

Del., Wilmington—Reynolds Candy Co., 415 Market St.—machinery and equipment for proposed 5 story candy factory.

Fla., Littleriver — Reid Furniture Mfg. Co.—2 or 3 cylinder sanding machine with oscillating motion in addition to forward motion; also planer.

Ill., Chicago—Independent Thread Mills, 43-45 South Wells St.—machinery suitable for glazing cotton yarns.

Ind., Brazil—Stout Furniture Co.—woodworking machinery and equipment for 3 story addition to factory.

Ind., South Bend—E. P. Caldwell—machinery and equipment for $1,000,000 truck and farm tractor plant.

Ind., Wabash — F. J. Rettig, 455 West Canal St., (planing mill)—power blower and rip saw.

Kan., Atchinson—J. Kaaz Mfg. Co., 12th and Main Sts., (cabinet works)—saw filing and setting machine, screws for veneer presses and one band resaw.

Kan., Wichita—Metz Lumber Co., 401 North Main St., H. Tuggle, Purch. Agt.—power sander, combination saw and planer.

Ky., Bowling Green—Central Producing & Refining Co—oil refinery equipment, including conveying machinery, agitators, etc.

Ky., Bowling Green—Rock Asphalt Co.—machinery and equipment for proposed refinery at Brownsville.

Md., Hyattsville — R. McQuinn, (woodworker)—Barnes mortiser.

Md., Texas—Maryland Mineral Co., R. L. Lovell, Pres.—one 36 or 42 in. buhr or emery mill.

Mass., Boston—W. H. Field Co., 39 Washington St., N.—woodworking machinery.

Mich., Farmington—D. Starkey—ideal automatic power tamping machine and power chimney block machine.

Miss., Hattiesburg—G. M. McWilliams—high grade felting machine, cotton picker and cleaner.

Miss., Vicksburg—Bd. Educ.—vocational equipment for $225,000 junior high school.

Mo., Kansas City—Swartz Cabinet Wks., 1515 Minnesota St., A. Swartz, Purch. Agt. —36 in. bandsaw.

Mo., Kansas City—Wood Work Shop, 4602 Troost Ave.—jointer.

Mo., St. Louis—J. Cohnberg, 1299 Goodfellow Ave.—two 1,000 gal. gasoline tanks and pumps for oil filling station on Goodfellow and Page Aves.

Mo., St. Louis—Henry Maginnis Tire Co., 1428 North 10th St.—two 1,000 gal, underground gasoline tanks and pumps.

Mo., St. Louis—J. M. Meinhardt, 2902 Hebert St.—two pumps and one 1,000 gal. gasoline storage tank for oil filling station on Glasgow Ave. and Hebert St.

Mo., St. Louis — E. F. Zumwinkel, 4200 Lafayette Ave.—three 1,000 gal. gasoline tanks and pumps for oil filling station on Grand Blvd. and Bates St.

N. Y., Buffalo—S. H. Horn, 217 Leroy Ave.—machinery equipment for proposed factory for the manufacture of automobile bodies.

N. Y., Buffalo—A. Oppenheimer, 187 Ellicott St.—shoe repairing machinery, electrically driven.

N. Y., Buffalo—Superior Elevator Co., Chamber of Commerce Bldg., H. F. Keistch, Secy.—elevator and milling machinery for $275,000 grain elevator.

N. Y., Canton—Dishaw Fdry. Co., C. F. Dishaw, Purch. Agt.—foundry equipment, including 2 ton ladle crane.

N. Y., Carthage—Adirondack Core & Plug Co., 541 West End Ave., (wood plugs)—heavy duty circular rip saw with table and carrier.

N. Y., Carthage—Jefferson Mfg. Co., W. H. Gehm, Purch. Agt.—woodworking machinery and equipment for furniture factory.

N. Y., Dayton—L. Tarbell, (blacksmith) —Acme blower for forge.

N. Y., Eggertsville — Bd. Educ., R. E. Boetgger, Trustee—vocational equipment for $182,000 school.

N. Y., Gouverneur—G. C. Washburn Co., Hailesboro St., (repair shop) — power operated sanding machine.

N. Y., Lowville—Conifer Lumber Co., Inc., G. A. Sealy, Purch. Agt.—woodworking machinery and equipment.

N. Y., New York—A. Loewy, 200 5th Ave. several baling presses.

N. Y., North Tonawanda—Erie Live Stock Corp.—hand dryer system, approximate capacity 35 ton per day.

N. Y., Perry—Andrus Lumber Mill—lumber mill machinery.

N. Y., Theresa—Hubert Calhoun Co.—sawmill machinery and equipment.

N. Y., Rochester — W. F. Rochlen, 39 North Water St.—one rolling machine, 60 in. wide.

N. Y., Watertown—C. Baxter Co., State St.—air compressor, storage tank, electric drive motor, one ½ ton chain hoist, tubing, etc., for service station.

N. Y., Watertown — Watertown Radio Service, Inc., 112 Park St., (electrical engineering and repairing), C. H. Sheffield, Mgr.—small machinery and hand tools for the manufacture and repair of radio parts.

N. Y., Water Valley—Water Valley Fdry. Co.—complete foundry equipment.

O., Alliance—G. H. Newton, c/o Reeves Bros., Rush St.—machinery and iron working equipment for the manufacture of special machinery for carbonizing of coal.

O., Canton—A. E. Osborne, Mgr.—machinery, including wood turning and milling machinery, for the manufacture of automobile spokes.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—No. 2 foundry pig iron advanced 50c. in Chicago and $1 per ton in Birmingham, during week; basic also rose 50c. in Philadelphia and 75c. per ton in Pittsburgh. Wrought-iron pipe discounts reduced four points on Pittsburgh basing card of Feb. 3; change reflected in warehouse quotations.

Steel shapes and bars at minimum of $2.25 per 100 lb., Pittsburgh, in small lots for early delivery; plates, $2.35. Rise equivalent to $2 per ton over last week's maximum of $2.10 per 100 lb. at mill. Present level up to emergency prices of early part of September, at which time 20 per cent wage advance and increased fuel costs caused advance. Present rise due to unusual demand for oil-country goods; fabricated structural steel, automobile and agricultural implement materials. Shapes and bars, however, quoted at minimum of $2.15 and plates at $2.20, on exceptionally large contracts.

Zinc up 10c. per 100 lb. in New York warehouses. Slight advances also reported in fabricated brass and copper, and solder. Linseed oil up 6c. per gal. since last week. Improvement in copper demand; tin firmer.

Declines—Lead dropped 10c. per 100 lb. in New York during week; market quiet.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.55
Northern Basic	29.27
Southern Ohio No. 2	29.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.94
BIRMINGHAM	
No. 2 Foundry	25.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	30.14
Virginia No. 2	33.17
Basic	28.50
Grey Forge	28.14
CHICAGO	
No. 2 Foundry local	29.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	28.00
Basic	29.27
Bessemer	29.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb..

Detroit	6.0
Cleveland	5½@6
Cincinnati	4½@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50@2.75	4.19	3.65	4.00
No. 12	2.60@2.85	4.24	3.70	4.05
No. 14	2.70@2.95	4.29	3.75	4.10
No. 16	2.90@3.15	4.39	3.85	4.20
Black				
Nos. 17 and 21.	3.20@3.35	4.70	4.05	4.70
Nos. 22 and 24.	3.25@3.40	4.75	4.10	4.70
Nos. 25 and 26.	3.30@3.45	4.80	4.15	4.75
No. 28	3.35@3.50	4.90	4.25	4.85

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	3.35@3.50	4.90	4.15	4.85
Nos. 12 and 14.	3.45@3.60	5.00	4.25	4.95
Nos. 17 and 21.	3.75@3.90	5.30	4.55	....
Nos. 22 and 24.	3.90@4.05	5.45	4.70	5.40
No. 26	4.05@4.20	5.60	4.95	5.55
No. 28	4.35@4.50	5.90	5.25	5 90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Inches	Steel Black	Steel Galv.	Inches	Iron Black	Iron Galv.
		BUTT WELD			
1 to 3	64	52½	¾ to 1½	30	13
		LAP WELD			
2	57	45½	2	23	7
2½ to 6	61	49½	2½ to 4	28	13
7 to 8	58	45½	4½ to 6	28	13
9 to 12	57	44½	7 to 12	26	11
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	62	51½	¾ to 1½	30	14
2 to 3	63	52½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	55	44½	2	23	9
2½ to 4	59	48½	2½ to 4	29	15
4½ to 6	58	47½	4½ to 6	28	14
7 to 8	54	41½	7 to 8	21	7
9 to 12	48	35½	9 to 12	16	2

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	54%	41%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	51%	38%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list less 1%. Cast iron, standard sizes, 29% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.54	4.36	4.30
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.30	5.50
Cold finished shafting or screw	4.05	3.75	3.95
Cold finished flats, squares	4.55	4.25	4.45
Structural shapes (base)	3.29	3.16	3.05
Soft steel bars (base)	3.19	3.06	2.95
Soft steel bar shapes (base)	3.19	3.06	2.95
Soft steel bands (base)	3.99	3.61	3.70
Tank plates (base)	3.29	3.01	3.02½
Bar iron (2.75 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40@55%	50%
Electric welding wire:			
5/32	8.50		12@13
1/8	7.00		11@12
5/32 to 1/4	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.75
Tin, 5-ton lots, New York			41.12½
Lead (up to carlots), St. Louis	8.10@8.15;	New York.	8 52½
Zinc (up to carlots), St. Louis	7.10;	New York.	7.55

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	25.00	26.00
Antimony (Chinese), ton spot	8.50	8.50	8.25
Copper sheets, base	23.75	22.25	23.00
Copper wire (carlots)	17.00	19.00	16.25
Copper bars (carlots)	21.00	24.00	19.50
Copper tubing (carlots)	25.25	26.00	23.00
Brass sheets (carlots)	19.25	22.00	18.75
Brass tubing (carlots)	23.50	25.00	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (carlots)	17.25	20.25	15.75
Brass wire (carlots)	19.75	22.00	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ½), (caselots)	30.50	26.25	20.00
Babbitt metal (83% tin)	42.00	49.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	12.75	12.75
Copper, heavy, and wire	12.25	12.25	12.25
Copper, light, and bottoms	10.50	10.75	11.50
Lead, heavy	5.75	6.00	5.75
Lead, tea	5.25	4.75	5.75
Brass, heavy, yellow	7.00	....	7.75
Brass, heavy, red	9.50	10.25	10.00
Brass, light	6.00	6.00	6.75
No. 1 yellow brass turnings	7.00	7.50	7.75
Zinc	4.50	4.50	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.13	$0.11½
Cotton waste, colored, per lb.	.07@.12	.10	.08
Wiping cloths, 13½x13½, per lb.	.16	32.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.60	2.40	2.65
Roll sulphur, per 100 lb.	3.40	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.99	1.01	1.02
White lead, dry or in oil	100 lb. kegs.	New York,	14.25
Red lead, dry	100 lb. kegs.	New York,	14.25
Red lead, in oil	100 lb. kegs.	New York,	15.75
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$8.00@8.50	
Coke, prompt foundry, Connellsville	per net ton	9.00@9.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅜ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60%	50-10%	40-10%
Second grade	65%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

O., Cleveland—Natl. Refining Co., Natl. Bldg., S. White, Purch. Agt.—equipment for oil distributing station at Madison, Wis.

O., Columbus—City Ice & Fuel Co., 397 West Broad St., G. H. Kittredge, Genl. Mgr.—equipment for two additional retail coal yards.

O., Columbus—Corrugated Container Co., Dublin Ave., L. Kohn, Mgr.—one slotter and other machinery.

O., Louisville — Louisville Planing Mill Co., F. E. Anderson, Purch. Agt.—woodworking machinery, including planers, cutoff saws, molders, etc., to increase capacity of plant.

O., Mount Gilead—Hydraulic Press Mfg. Co., F. McMillan, Genl. Mgr.—woodworking machinery, also brass foundry and pattern shop equipment.

O., Newcomerstown—J. B. Clow & Son—foundry equipment.

O., South Zanesville—Kohler Bent Wood Wks., (mill work, etc.)—machinery for mill, including planers, saws, molding machines, etc., to replace that which was destroyed by fire.

O., Warren—Grinnell Co.—galvanizing machinery and equipment.

Ore., Nekoma (Mapleton P. O.)—H. E. Poe—sawmill machinery, including planer.

Ore., Portland—Crystal Ice & Storage Co., 427 East Main St., G. W. Weatherly, Pres.—refrigerating machinery for proposed ice cream plant at Astoria.

Pa., Allentown—Lehigh Star Bedding Co., 310 Lehigh St., (manufacturer of bedsteads)—machinery and equipment for enameling department.

Pa., Altoona—S. Evin, 1719 Union Ave.—shoe repairing machinery.

Pa., Chambersburg — D. P. Minick, 147 East Queen St.—ice and cold storage plant machinery.

Pa., Gillett—H. Kerrick—saw frame with table and saw.

Pa., Hollidaysburg — Wright Laundry, J. H. Wright, proprietor—machinery and equipment for proposed laundry.

Pa., Indiana—Conemaugh Iron Wks.—molding machine equipment and furnaces for the manufacture of cast iron enamelware at Blairsville.

Pa., Kingston (Wilkes-Barre P. O.)—O. Smith Co.—machinery and equipment for carpet cleaning plant.

Pa., Lancaster—Hubley Mfg. Co., Plum St. and Elizabeth Ave.—machinery and equipment for 2 story addition to factory for the manufacture of mechanical toys.

Pa., Nanticoke—Susquehanna Collieries, Inc.—machinery and equipment for coal breaker, including conveying machinery.

Pa., Phila.—F. W. Wheeler, 2911 C St., (machinery dealer)—several No. 50 and No. 90 style Universal winding machines; 72 in. and 92 in. Crompton and Knowles make looms.

Pa., Pottstown—Spicer Mfg. Co. (manufacturer of universal joints)—machinery and equipment for addition to factory.

Pa., Rossville—Peerless Woolen Mills—weaving equipment, looms and other machinery for $300,000 addition to plant.

Pa., Sharpville—F. C. McKnight, 8th St.—special machinery for the manufacture of patented ratchet car brake for railway cars.

Pa., Titusville—Oil Creek Refining Co.—equipment, including air compressor, for gasoline and service station at Pleasantville.

Pa., York — W. Christensen, (manufacturer of ornamental iron)—complete machinery and equipment for new plant.

R. I., Pawtucket—Tubular Woven Fabric Co., Pawtucket Ave.—equipment for proposed addition to mill.

Tenn., Nashville — Hermitage Portland Cement Co., 174 3rd Ave., N.—complete equipment, including ovens, kilns, etc., for proposed cement plant.

Va., Roanoke—E. Buchanan, Box 1172—cement block making machinery.

Wash., Olympia — Olympia Veneer Co., Inc., Jefferson and 3rd Sts.—$30,000 worth of equipment for addition to plant.

Wis., Columbus—H. Guenther—gasoline storage tanks and pumps for proposed filling station at Beaver Dam.

Wis., Merrill—W. J. Fechtner—grinding and refrigeration machinery for proposed sausage factory.

Wis., Milwaukee — Amazeen Shoe Co., 2901 Meinecke Ave., H. C. Amazeen, Purch. Agt.—shoe working machinery, including lasting and stitching machines.

Wis., Milwaukee—Badger Chair & Furniture Co., c/o F. C. Klode, 217 2nd St.—bandsaw, about 30 in.

Wis., Milwaukee — G. M. Memmel, 1027 25th St. (woodwork)—one 5 ft. cutoff saw, motor driven.

Wis., Milwaukee—Milwaukee Wadding & Comfort Mills, 415 3rd St.—textile machinery for proposed factory on Clybourn St.

Wis., Milwaukee — D. Schneider, 945 27th St. (woodwork)—30 in. band saw, 3 in. sticker, also medium size planer, all motor driven.

Wis., Milwaukee—South Side Malleable Castings Co., 14th and Windlake Aves.—annealing outfit.

Wis., Milwaukee—G. E. Steuerwald, 622½ 53rd St. (carpenter and woodwork)—Universal woodworking machine, several operations (used preferred).

Wis., Wausau—E. A. Steckel, 320 3rd St.—equipment, including presses, etc., for proposed printing shop.

Alta., Coleman—McGillvray Creek Coal & Coke Co.—furnace and other equipment.

B. C., Vancouver—False Creek Lumber Co., Ltd.—rotary head-saw, 10 x 60 in. edgers; roller reband saw; 24 x 30 in. planer; small machinery for sawmill.

N. B., Fredericton — Palmer-McLellan Shoepack Co., Ltd., (manufacturer of waterproof footwear)—machinery for plant.

Ont., London—Orange Crush Bottlers, W. Lindsay, Mgr.—complete machinery and equipment.

Ont., London—Reid Bros., 391 Clarence St.—machinery and equipment for the manufacture of stationery, to replace that which was destroyed by fire.

Ont., Orillia—Carriage Factories, Ltd., G. E. Elliott, 443 St. James St., Montreal, Purch. Agt.—woodworking machinery for Montreal plant.

Ont., Toronto—Churchill Mining & Milling Co., 117 King St., W., W. R. Knox, Orillia, Pres.—machinery and equipment for development work.

Que., Montreal—Hogue Ltd., 235 Chatham St.—box making equipment.

Que., St. Therese de Blainville—Dominion Furniture Mfg. Co., J. Fortin, Purch. Agt.—woodworking machinery.

Metal Working Shops

Calif., Orland—Grant & Goldstein (Ford agents) plan to build a 1 story, 80 x 100 ft. garage.

Calif., Pittsburgh — The Columbia Steel Corp., Balboa Bldg., San Francisco, awarded the contract for the construction of a group of 5 steel plant buildings, here. Noted Jan. 4.

Calif., San Francisco—L. R. Lurie, Mills Bldg., awarded the contract for the construction of a 2 story garage on Fell and Gough Sts. Estimated cost $125,000. Pacific Telephone & Telegraph Co., 333 Grant Ave., lessee. Noted Jan. 25.

Ill., Chicago — E. Katzinger & Co., 910 West Washington Blvd., manufacturer of utensils, tools and machinery, is having plans prepared for the construction of a 2 story factory to contain 200,000 sq.ft. of floor space, on Armitage and Cicero Sts. Estimated cost $1,000,000. A. S. Alschuler, 28 East Jackson Blvd., Archt.

Ill., Chicago—A. G. Miller, 53 West Jackson Blvd., awarded the contract for the construction of a 1 story, 75 x 100 ft. welding shop at 2613-17 State St. Estimated cost $25,000.

Kan., Augusta—The Schoeb Motor Co. is having plans prepared for the construction of a 1 story, 125 x 125 ft. garage. Estimated cost $40,000. E. Forshlom, 405 Sedgwick Bldg., Wichita, Archt.

Kan., Emporia—The Atchison, Topeka & Santa Fe Ry., 80 East Jackson Blvd., Chicago, is having plans prepared for the construction of round house, machine shop, etc., here. Cost between $4,000,000 and $5,000,000. C. F. W. Felt, Ch. Engr.

Minn., Minneapolis—I. S. Whitman, 932 Hennepin Ave., awarded the contract for the construction of a 1 and 3 story, 55 x 110 ft. and 55 x 65 ft. garage and office building at 216 South 10th St. Estimated cost $60,000.

Minn., St. Paul—S. K. Fitch, 519 Montrose Ave., is having plans prepared for the construction of a 1 story, 56 x 198 ft. garage on Rice St. and Como Ave. Estimated cost $50,000. W. M. Ingeman, 637 Endicott Bldg., Archt.

Mo., St. Louis—The Polar Wave Ice & Fuel Co., Olive St. near Grand Blvd., awarded the contract for the construction of a 1 and 2 story, 60 x 123 ft. garage on 12th St. Estimated cost $40,000.

N. Y., Brooklyn—A. L. Jaffe, c/o Seelig & Finkelstein, Engrs., and Archts., 44 Court St., will build a 1 story, 25 x 100 ft. garage on 14th St. Estimated cost $50,000.

N. Y., Buffalo—The Peerless-Husker Co., 523 Cornwall Ave., plans to build an addition to its canning machinery plant. Estimated cost $10,000. Engineer or architect not announced.

N. Y., Buffalo—The Standard Oil Co. of New York, 103 Elk St., plans to build a barrel plant. Estimated cost $175,000. Engineer or architect not announced.

N. Y., New York—The Claremont Palace Garden, Inc., c/o M. W. Del Gaudio, Engr. and Archt., 158 West 45th St., awarded the contract for the construction of a 1 story, 200 x 210 ft. garage on 170th St. and 3rd Ave. Estimated cost $100,000. D. Piciujo, Pres.

N. Y., New York—E. E. Smathers, c/o J. M. Felson, Engr. and Archt., 1133 Bway., will build a 1 story, 150 x 200 ft. garage at 4353 Bway. Estimated cost $75,000.

O., Cleveland—The Perfection Trailer & Mfg. Co., 1453 West 110th St., will soon award the contract for the construction of a 2 story, 100 x 200 ft. factory. Estimated cost $60,000. A. L. Hohlfelder, Genl. Mgr. H. W. Grieme, 110 Engineers' Bldg., Cleveland, Archt.

O., East Cleveland (Cleveland P. O.)—The city is having plans prepared for the construction of a 1 story garage and barn on Marloes Ave. Estimated cost $50,000. M. B. Garnett, City Hall, East Cleveland, Archt.

O., Lakewood (Cleveland P. O.)—R. G. Curren, Leader-News Bldg., Cleveland, awarded the contract for the construction of a 1 story, 41 x 100 ft. garage at 18123 Detroit Ave., here. Estimated cost $40,000.

O., Niles—The Ohio Galvanizing Co. awarded the contract for the construction of a 1 story, 76 x 120 ft. addition to its factory for the manufacture of iron and galvanized products, including ice cases for refrigerators. A. J. Bentley, Secy.

Okla., Oklahoma City—L. Perrine, 130 West 1st St., awarded the contract for the construction of a 2 story, 60 x 140 ft. garage on 6th St. Estimated cost $39,800.

Okla., Tulsa—The Missouri, Kansas & Texas R.R., Railway Exch. Bldg., St. Louis, plans to build a large repair station, etc., west of here.

Pa., Monaca—The Nichols Wire & Sheet Co., Rochester, is having plans prepared for the construction of a 1 story, 80 x 300 ft. factory on Pennsylvania Ave. and 17th St., here. Estimated cost $50,000. Private plans.

Pa., New Castle—The Standard Wire Co., 716 West Brant St., is having plans prepared for the construction of a 1 story, 40 x 135 ft. factory on Sampson St. Private plans. Noted Nov. 23.

Pa., Pittsburgh — The Amer. Metallic Packing Co., 3621 Mexico St., awarded the contract for the construction of a 2 story, 30 x 34 ft. addition to its factory. Estimated cost $50,000.

Pa., Pittsburgh—The D. N. Carlin Co., 125 Denniston Ave., manufacturer of toys, awarded the contract for the construction of a 2 story, 34 x 115 ft. addition to its factory. Estimated cost $19,000. Noted Aug. 3.

Pa., Pittsburgh—The Pittsburgh Meter Co., East Pittsburgh, awarded the contract for the construction of a 5 story, 80 x 300 ft. factory on Susquehanna St., here. Estimated cost $350,000. Noted Feb. 1.

Pa., Reading — The Reading Hardware Co., foot of 6th St., awarded the contract for the construction of a 7 story, 80 x 259 ft. factory. Noted Jan. 18.

Pa., Wilkes-Barre — The Wilkes-Barre Iron & Wire Wks., Inc., Coal Exch. Bldg., is having plans prepared for the construction of a 60 x 100 ft. fabricating plant. Estimated cost $19,000. J. S. Wilson, Mgr. Private plans.

Wis., Chilton — Hingess & Bessler, Kiel, and W. F. Neumann, Archt., 114 Grand Ave., Milwaukee, are receiving bids for the construction of a 1 story, 60 x 150 ft. garage, here. Estimated cost $40,000. Noted Jan. 11.

Wis., Eau Claire—K. M. Knudson, 107 North Farwell St., is having plans prepared for the construction of a 2 story, 55 x 100 ft. machine and forge shop. Estimated cost $50,000. Private plans.

Wis., Kenosha—The North Side Garage awarded the contract for the construction of a 1 story, 82 x 125 ft. garage. Estimated cost $40,000. W. Russel, Mgr.